PATENT ABSTRACTS OF JAPAN

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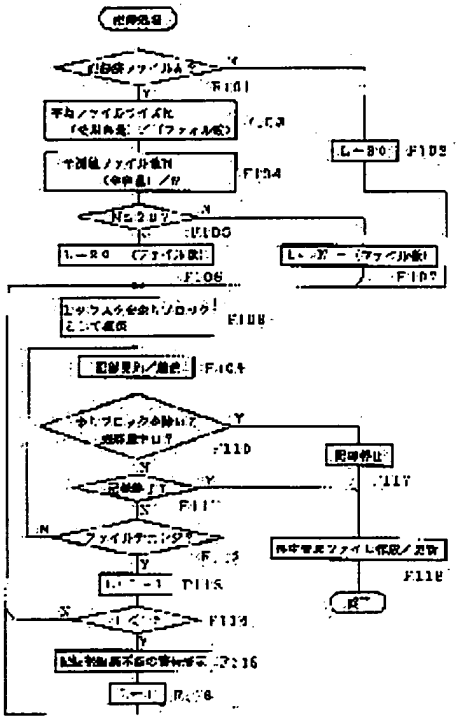
(54) RECORDING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To secure a state that recording or editing is made properly executable.

SOLUTION: The required amounts of surplus block are set at the time of a recording operation, and when residual recordable block amounts other than the surplus block amounts reach zero, a program recording operation is ended. After the recording of the program (contents) is ended, the recordable capacity equivalent to at least the surplus block amounts is left.



* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1]A recorder comprising:
A program documentation means which blocks and records a program to a recording medium with which record is performed by a block unit.
While setting the amount of remainder blocks of requirements to a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, A control means which will terminate recording operation by said program documentation means by recording operation by said program documentation means if a block residue in which said record excluding the amount of blocks not much is possible serves as zero on a recording medium.

[Claim 2]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] as a block used for record of management information according [said control means] to said management information recording device, or edit of a program updated and/or recorded.
[Claim 3]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] according to the number of programs currently recorded on a recording medium in the case of recording operation according [said control means] to said program documentation means.
[Claim 4]The recorder according to claim 1 characterized by said thing [setting up the amount of blocks not much] according to average data size of a program currently recorded on a recording medium, and capacity of a recording medium in the case of recording operation according [said control means] to said program documentation means.
[Claim 5]The recorder according to claim 1, wherein said control means outputs warning of editing processing about a program currently recorded on the recording medium being made

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the recorder which records programs (contents), such as audio information and a video data, on a recording medium, for example.
[0002]
[Description of the Prior Art]The electrically rewritable nonvolatile memory called EEPROM (Electrically Erasable Programmable ROM), Since 1 bit was constituted from two transistors, the occupation area per bit was large and the limit was to make a degree of location high. In order to solve this problem, the flash memory which can realize 1 bit with one transistor with all the bit collective erasure methods was developed. The flash memory is expected as what can be replaced with recording media, such as a magnetic disk and an optical disc.
[0003]The memory card which constituted the flash memory to apparatus enabling free attachment and detachment is also known. If this memory card is used, record/playback equipment, such as digital audio information which change to disk like media, such as the conventional CD (compact disk) and MD (mini disc), and uses a memory card, are realizable.
[0004]And in the system which carries out record reproduction of the programs (it is also called contents), such as audio information and a video data, by using the memory card using a flash memory as a recording medium. For example, FAT (File Allocation Table) which is a file manager system conventionally used with a personal computer Edit of contents is easily attained by adopting a file system and the device of file management information. For example, if it assumes that the audio information as one musical piece is recorded as one contents, The DEBAIDO edit which divides the contents and is made into two contents, i.e., two music, the combine edit which is made to combine two contents conversely and is made into one contents, i.e., one music, etc. are possible. Thereby, in a user side, it also becomes possible to process arbitrarily the contents recorded on the memory card, and to enjoy them.
[0005]
[Problem(s) to be Solved by the Invention]By the way, it is considered as the system into which the contents as audio information can be edited conventionally, and the mini disc system is known. At this mini disc system, edit of contents has been realized by rewriting what is called TOC data that are the management information which manages contents. And on the mini disc (magneto-optical disc), the program area which records contents, and the management information field which records TOC data are set as according to by predetermined capacity, respectively, and the amount of information of TOC data did not affect the storage capacity of the program (contents). Since it all is [that rewriting of the TOC data in a management information field is only performed, and] even if it repeats edit how many times, this does not affect the storage capacity of a program (contents), either.
[0006]However, if writing is repeated in the same position when it is a flash memory, it is made

suitable from there being character in which a memory life is shortened remarkably to move a writing position continuously. For this reason, when the field which records contents in a memory card, and the field which records the management information which manages contents are not pinpointed, for example, it updates management information, new management information is written in a new field, and recording operation which eliminates the old management information is performed. This means that it is necessary to secure only the field which can newly write in ******** management information, when renewal of management information is needed in connection with the recording operation and edit operation of contents. If it puts in another way and there will be no availability more than predetermined, it will be in the state where it becomes what cannot perform renewal of management information, and recording operation is not completed by this, and edit is impossible. In the memory card which performs management of data, etc. by the prescribed unit called block, the amount of 1 block may newly be needed in the cases, such as DEBAIDO edit, for example. If this does not have an availability more than predetermined, either, it means that edit of contents cannot be performed.

[0007]That is, when using the memory card using a flash memory as a recording medium, When the remaining record possible capacity of a memory card becomes less than predetermined by record of contents, there is inconvenience of it becoming impossible to perform renewal of management information required after record and edit about contents currently recorded.

[0008]

[Means for Solving the Problem]An object in view of such a problem of this invention is for editing processing to enable it renewal of management information according to record of a program (contents), and to perform appropriately.

[0009]For this reason, a recorder of this invention receives a recording medium with which record is performed by a block unit, While setting the amount of remainder blocks of requirements to a program documentation means which blocks and records a program, and a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, By recording operation by a program documentation means, if a recordable block residue except the amount of blocks serves as zero not much on a recording medium, it will have a control means which terminates recording operation by a program documentation means. That is, as a block used for record or updating of management information, and recorded edit of a program, the amount of blocks is set up not much, and recording operation of a program is ended, where capacity set up not much as an amount of blocks is left.

[0010]

[Embodiment of the Invention]Hereafter, the embodiment of the invention is described. According to this embodiment, the memory card which carries the nonvolatile memory (flash memory) as an example of a recording medium is mentioned, and the recorder which can perform record reproduction operation to a memory card as an example of a recorder is mentioned. Although the data as a program (contents) which can be treated in an embodiment has various kinds of things, such as video datas, such as audio information, a video data, and still picture data, text data, and program data, an explanation top shall treat audio information, such as a musical piece. in addition -- making pictures other than digital audio signals, a character, etc. into additional information, even when treating audio information as main contents -- record/-- it becomes refreshable. Explanation is given in the following order.

1. Composition 3. file system [Data file 4. recording processing 4-1 / Example 14-2 of processing / Example 24-3 of processing / Example 3 of processing] 3-1 of composition 2. memory card of recorder Treatment structure and data structure 3-2 directory configuration 3-3 Managing structure and edit method 3-4 Reproduction management file 3-5 [0011]1. The lineblock diagram 1 of a recorder explains the composition of the memory card recording and reproducing device (the following, recorder 1) which can carry out record reproduction of the programs (contents), such as audio information, to a memory card. The memory card which can be detached and attached freely

is used for this recorder 1 as a recording medium. And this recorder 1 may be constituted as audio equipment of a simple substance, and may be constituted as an apparatus part built in a personal computer, or an audio / visual apparatus. When you consider it as the audio equipment of a simple substance, let the recorder 1 be a recording and reproducing device of a deferred type or portable small size, for example. In that case, an audio system can also be constituted with an amplifier device, a loudspeaker, a CD player, an MD recorder, a tuner, etc. As a gestalt built in other apparatus, it is the same positioning as a CD-ROM drive or a floppy disk drive, for example in a personal computer, and can adopt as a memory card drive. It is also possible to build the recorder 1 in a video camera or a game machine machine furthermore, and to use a memory card as a recording medium of a video data or audio information. The recorder 1 is not concerned with the above-mentioned simple substance type and built-in, but can be applied also as a recorder which records the digital audio signals etc. which are distributed via data communications, digital broadcasting, the Internet, etc. which use a satellite.

[0012]Drawing 1 shows the general composition as a memory card recording and reproducing device realizable in the mode of these various kinds. The recorder 1 has the audio encoder / decoder IC10 which comprised a 1 chip IC, respectively, security IC20, and DSP(Digital Signal Processor) 30. And the memory card 40 which can be detached and attached freely is used as a recording medium to the recorder 1. The IC form of the security block with which the memory card 40 includes the enciphering circuit of a flash memory (nonvolatile memory), a memory control block, and DES (Data Encryption Standard) is carried out on 1 chip. In this example, although DSP30 is used, it may replace with DSP and a microcomputer may be used.

[0013]An audio encoder / decoder IC10 have the audio interface 11, and an encoder / decoder block 12. The data which carried out high efficiency coding of an encoder / the decoder block 12 in order to write digital audio signals in the memory card 40, and was read from the memory card 40 is decoded. As a highly efficient encoding method, what (it is written as ATRAC3) improved ATRAC (AdaptiveTransform Acoustic Coding) adopted with the mini disc can be used.

[0014]In ATRAC3, the audio information of 16 bits of one sample sampled at 44.1 kHz is processed. The minimum data unit when processing audio information by ATRAC3 is the sound unit SU. 1SU compresses a part for 1024 samples (1024x16 bits x two channels) into hundreds of bytes, makes it time, and is an about 23-m second. About 1/of audio information is compressed into 10 by ATRAC3. In a mini disc, there is little degradation of the tone quality according to compression/elongation processing by signal processing by which ATRAC3 was devised so that that may be right.

[0015]The line-in selector 13 supplies selectively the reproducing output of MD, the output of a tuner, and a tape reproduction output to A/D converter 14. A/D converter 14 changes the selected line-in signal into digital audio signals of (sampling frequency =44.1kHz and 1 sample =16 bit). The digital input selector 16 supplies selectively the digitized output of MD, CD, and CS (satellite digital broadcasting) to the digital input receiver 17. A digital input is transmitted, for example via an optical cable. The digital input receiver's 17 output is supplied to the sampling rate converter 15, and the sampling frequency of a digital input is changed into 44.1 kHz.

[0016]The coding data obtained by the encoding processing in the encoder / decoder block 12 of an audio encoder / decoder IC10 is supplied to the enciphering circuit 22 of DES via the interface 21 of security IC20. The enciphering circuit 22 of DES has FIFO23. It has for the enciphering circuit 22 of DES to protect the copyright of contents. Although mentioned later, the enciphering circuit of DES is included also in the memory card 40. The enciphering circuit 22 of DES of the recorder 1 has a unique storage key for every apparatus with two or more master keys. The enciphering circuit 22 of DES can have a random number generation circuit, and the memory card 40, the attestation, and the session key which build in the enciphering circuit of DES can be shared. The enciphering circuit 22 of DES can apply a key again by a storage key through the enciphering circuit of DES more nearly further.

[0017]The audio information enciphered from the enciphering circuit 22 of DES is supplied to DSP

(Digital Signal Processor) 30. DSP30 performs communication which passes the memory interface 38 shown in drawing 2 between the memory cards 40 with which the attachment-and-detachment mechanism which is not illustrated was equipped, and writes the enciphered data in a flash memory. Serial communication is made between DSP30 and the memory card 40. In order to secure memory space required for control of the memory card 40, external SRAM (Static Random AccessMemory) 31 is connected to DSP30.

[0018]The terminal 32 is connected and it enables it to perform two-way communication of contents data or control data between the external instrument or the external circuit unit which is not illustrated to DSP30 furthermore. DSP30 communicates between external instruments etc. via the interface 37 shown in drawing 2. For example, when this recorder 1 comprises a simple substance, The predetermined communication method should respond, for example to USB, IEEE1394, IEC958, serial port communication, parallel port communication, etc., and communication of the interface 37 and the terminal 32 is enabled between a personal computer, an audio / visual apparatus, etc.

[0019]When this recorder 1 is built in a personal computer, an audio / visual apparatus, etc., the interface 37 and the terminal 32 will take the composition of the internal bus etc. which are connected with the system controller of those apparatus, for example.

[0020]From the apparatus connected to the terminal 32, or a part, various kinds of data is supplied to DSP30. For example, when the recorder 1 is made into the part of an audio system or a computer system, From the system controller of the exterior which controls operation of the whole audio system and computer system, the data of sound recording instructions, a reproduction command, etc. by which it was generated according to a user's operation is given to DSP30. The data of additional information, such as picture information and text, is also supplied to DSP30 via the terminal 32. Furthermore, DSP30 can also supply additional information data, a control signal, etc. which were read from the memory card 40 to an external system controller via the terminal 32.

[0021]The final controlling element 39 in which the operation key etc. to which a user performs various kinds of operations were provided, and the indicator 33 which presents various kinds of information to a user are shown in drawing 1. Especially these are needed when the recorder 1 comprises a simple substance, and when the recorder 1 is built [for example,] in a personal computer, direct continuation of the final controlling element 39 and the indicator 33 does not have to be carried out to DSP30. That is, in the case of a simple substance, although DSP30 will perform processing of the operational input from the final controlling element 39, and display control in the indicator 33, In a built-in case, it is for what is necessary being just to receive the information for which the contents which perform these control, and should supply operation information to DSP30 or the system controller of the device should display on it from DSP30 if needed are shown.

[0022]The audio information enciphered by DSP30 as contents read from the memory card 40 is decrypted by security IC20, and receives the decoding processing of ATRAC3 by an audio encoder / decoder IC10. And the decryption output of an audio encoder / decoder 10 is supplied to D/A converter 18, and is changed into an analog audio signal. And an analog audio signal is taken out by the line-out terminal 19.

[0023]Line-out is transmitted to the amplifier device etc. which are not illustrated, and is reproduced by the loudspeaker or headphone. A muting signal is supplied from an external controller to D/A converter 18. When a muting signal shows one of muting, the audio output from the line-out terminal 19 is forbidden.

[0024]Although drawing 1 shows only the line-out terminal 19, of course, a digital output terminal, a headphone jack, etc. may be provided. The output of the contents data to an external instrument can also be performed via the terminal 32 as mentioned above.

[0025]Drawing 2 shows the internal configuration of DSP30. DSP30 comprises the core 34, the flash memory 35, SRAM36, the interface 37, the memory card interface 38, and a bridge between buses. This DSP30 functions as a microcomputer similarly and the core 34 is equivalent to CPU. The

program for processing of DSP30 is stored in the flash memory 35. SRAM36 and SRAM31 of the exterior are used as a work memory for various processing.

[0026]DSP30 answers manipulate signals (or manipulate signal inputted from the final controlling element 39 shown in drawing 1), such as sound recording instructions received via the interface 37, The processing which writes in the enciphered predetermined audio information and predetermined additional information data to the memory card 40, and reads these data from the memory card 40 is controlled. Namely, the application software of the whole audio system for performing record/reproduction of audio information and additional information, DSP30 is located between the memory cards 40 and DSP30 operates with software, such as access of the memory card 40, and a file system.

[0027]The FAT filesystem for which the file management on the memory card 40 in DSP30 is used with the existing personal computer is used. In addition to this file system, by this example, the reproduction management file of a data configuration which is mentioned later is used. A reproduction management file manages the data file currently recorded on the memory card 40. Namely, the reproduction management file as the 1st file management information, Managing the file of audio information, FAT as the 2nd file management information manages the whole file on the flash memory of the memory card 0 including the file and reproduction management file of audio information. A reproduction management file is recorded on the memory card 40. FAT is beforehand written in on the flash memory with the root directory etc. at the time of shipment.

[0028]In this example, in order to protect copyright, the audio information compressed by ATRAC3 is enciphered. It is kept from on the other hand enciphering noting that a management file has unnecessary copyright protection. There may be what has an enciphering function also as the memory card 40, and a thing which it does not have. It is only a memory card with an enciphering function which can use the recorder 1 which records the audio information which is works like this example.

[0029]2. The lineblock diagram 3 of a memory card shows the composition of the memory card 40. As for the memory card 40, the control block 41 and the flash memory 42 are constituted as a 1 chip IC. The bidirectional serial interface between DSP30 of the recorder 1 and the memory card 40 consists of ten lines. Four main lines are with the clock line SCK for transmitting a clock at the time of data communications, status-line SBS for transmitting status, and data-line DIO and interruption line INT that transmit data. In addition, as a line for current supply, two line GND and two VCC lines are formed. The two lines Reserv are lines of the undefined.

[0030]The clock line SCK is a line for transmitting the clock in sync with data. Status-line SBS is a line for transmitting the signal showing the status of the memory card 40. The data line DIO is a line for outputting and inputting a command and the enciphered audio information. Interruption line INT is a line which transmits the interrupt signal which requires interruption to DSP30 of the recorder 1 from the memory card 40. When it equips with the memory card 40, an interrupt signal occurs. However, in this example, since he is trying to transmit an interrupt signal via the data line DIO, interruption line INT has been grounded.

[0031]Serial/parallel conversion, parallel/serial conversion, and the interface block 43 of the control block 41 (it abbreviates to S/P, P/S, and IF block) are the interfaces of DSP30 of the recorder connected via two or more lines mentioned above, and the control block 41. S/P, P/S, and the IF block 43 change into parallel data the serial data received from DSP30 of the recorder 1, are incorporated into the control block 41, change the parallel data from the control block 41 into serial data, and send them to DSP30 of the recorder 1. S/P, P/S, and the IF block 43 separate a command and data, and the command and data required for encryption for the usual access to the flash memory 42, when the command and data which are transmitted via the data line DIO are received.

[0032]That is, in the format transmitted via the data line DIO, a command is transmitted first and data is transmitted after that. S/P, P/S, and the IF block 43 distinguish a command and data

required for a usual command and data required for access, and encryption, seeing the code of a command. According to this discriminated result, a command required for the usual access is stored in the command register 44, and data is stored in the page buffer 45 and the light register 46. The error correction code-ized circuit 47 is formed in relation to the light register 46. The error correction code-ized circuit 47 generates the redundancy code of an error correction code to the data temporarily stored in the page buffer 45.

[0033]The output data of the command register 44, the page buffer 45, the light register 46, and the error correction code-ized circuit 47 is supplied to a flash memory interface and the sequencer (it abbreviates to memory I/F and a sequencer) 51. Memory IF and the sequencer 51 are the interfaces of the control block 41 and the flash memory 42, and control an exchange of the data between both. Data is written in the flash memory 42 via memory IF and the sequencer 51.

[0034]The contents (it is written as the audio information compressed by ATRAC3 and following ATRAC3 data) written in the flash memory 42, For copyright protection, it is enciphered by security IC20 of the recorder 1, and the security block 52 of the memory card 40. The security block 52 is provided with the following.

Buffer memory 53.

The enciphering circuit 54 of DES.

Nonvolatile memory 55.

[0035]The security block 52 of the memory card 40 has a unique storage key for every memory card with two or more attestation keys. The nonvolatile memory 55 stores a key required for encryption, and is not visible from the outside. For example, a storage key is stored in the nonvolatile memory 55. It has a random number generation circuit, attestation is possible with the exclusive (meaning in the system with the same use of the existing data format etc. which were decided) recorder 1, and a session key can be shared. It can perform reapplying a key in a storage key through the enciphering circuit 54 of DES more nearly further.

[0036]For example, attestation is made when the recorder 1 is equipped with the memory card 40. Attestation is made by the security block 52 of security IC20 of the recorder 1, and the memory card 40. The recorder 1 will check that a partner is the person himself/herself mutually, if it admits that the memory card 40 with which it was equipped is the person himself/herself (memory card in the same system) and the memory card 40 admits that a partner's recorder is the person himself/herself (recorder in the same system). If attestation is performed, the recorder 1 and the memory card 40 will generate a session key, respectively, and a session key will be shared. A session key is generated by the degree of attestation.

[0037]And at the time of the writing of the contents to the memory card 40, the recorder 1 enciphers a contents key with a session key, and the memory card 40 is passed. In the memory card 40, a contents key is decoded with a session key, it enciphers by a storage key, and the recorder 1 is passed. A storage key is a key unique to each of the memory cards 40, and the recorder 1 will write the contents which performed format processing and were enciphered as the enciphered contents key in the memory card 40, if the enciphered contents key is received.

[0038]At the time of data read-out from the flash memory 42, the read data is supplied to the page buffer 45, the read register 48, and the error correction circuit 49 via memory IF and the sequencer 51. And the data memorized by the page buffer 45 is made for an error correction by the error correction circuit 49. The output of the page buffer 45 and the output of the read register 48 by which the error correction was carried out are supplied to S/P, P/S, and the IF block 43, and are supplied to DSP30 of the recorder 1 via the serial interface mentioned above.

[0039]At the time of such read-out, the contents enciphered with the contents key enciphered by the storage key and the block key are read from the flash memory 42. And by the security block 52, a contents key is decoded by a storage key. It is enciphered with a session key and the contents key furthermore decoded is transmitted to the recorder 1 side. The recorder 1 decodes a contents

key with the received session key. The recorder 1 generates a block key by the decoded contents key. With this block key, ATRAC3 enciphered data is decoded one by one.
[0040]The version information of the memory card 40, various kinds of attribution information, etc. are stored in configuration ROM50. The memory card 40 is equipped with the operational switch 60 for erroneous erasure prevention for the user if needed. When this switch 60 is in the connected state of the prohibition on elimination, even if the command which directs to eliminate the flash memory 42 is sent from the recorder side, elimination of the flash memory 42 is forbidden. The oscillator 61 generates the clock used as the timing basis of processing of the memory card 40.
[0041]3. File system 3-1 Treatment structure and the data structure diagram 4 show the file system processing hierarchy of the system which uses the memory card 40 as a storage. As a file system processing hierarchy, an application process layer is the top and a file management processing layer, a logical address management layer, a physical address management layer, and flash plate memory access set one by one to the bottom of it. In this layered structure, a file management processing layer is a FAT filesystem. The physical address was attached to each block of a flash memory, and the correspondence relation between a block and a physical address is eternal. A logical address is an address which a file management processing layer treats logically.
[0042]Drawing 5 shows an example of the physical configuration of the data of the flash memory 42 in the memory card 40. The data unit by which the flash memory 42 is called a segment is divided to the block (fixed length) of a predetermined number, and 1 block is divided to the page (fixed length) of a predetermined number. In the flash memory 42, it is carried out by elimination bundling up by a block unit, and writing and read-out are performed by bundling up per page.
[0043]Each block and each page are made into the respectively same size, and 1 block is constituted from the page 0 by the page m. It is considered, for example as an 8-KB (K byte) byte or the capacity of 16 KB, and let 1 page 1-block be the capacity of 512B. In the flash memory 42 whole, by the case of 1 block = 8 KB, it is referred to as 4 MB (512 blocks) and 8 MB (1024 blocks), and by the case of 1 block = 16 KB. It is considered as the capacity of 16 MB (1024 blocks), 32 MB (2048 blocks), and 64 MB (4096 blocks).
[0044]1 page consists of 512 bytes of data divisions, and 16 bytes of redundancy parts. Let 3 bytes of the head of a redundancy part be an over-writing portion rewritten according to renewal of data. Block status, page status, and updating status are recorded on 3 bytes of each byte sequentially from a head. 13 bytes of contents of the remainder of a redundancy part are considered as immobilization according to the contents of the data division in principle. These 13 bytes consist of a management flag (1 byte), a logical address (2 bytes), the fields (5 bytes) of format reserve, distributed information ECC (2 bytes), and data ECC (3 bytes). Distributed information ECC is redundant data for error corrections to a management flag, a logical address, and format reserve, and data ECC is redundant data for error corrections to 512 bytes of data.
[0045]As a management flag, it is a system flag (the value and). [1-:-user-] 0: Each flag of a boot block, a translation table flag (1: invalidity, 0:table block), copy prohibition specification (1:O.K., 0:NG), and an access permit (1:free, 0: lead protection) is recorded.
[0046]Two blocks 0 of the head in a segment, i.e., a block, and the block 1 are boot blocks. The block 1 is an object for backup to which the same data as the block 0 is written. A boot block is a leading block of the effective block in the memory card 40, and when apparatus is loaded with the memory card 40, it is a block accessed first. The remaining block is a user block. A header, a system entry, and boot & attribute information are stored in the page 0 of the head of a boot block. Disable block data is stored in the page 1. CIS (Card Information Structure)/IDI (Identify Drive Information) is stored in the page 2.
[0047]The number of entries effective [the header of a boot block] in boot block ID and a boot block is recorded. The starting position of disable block data, its data size, a data type, the data starting position of CIS/IDI, its data size, and a data type are recorded on a system entry. boot & attribute information -- the type (read-only.) of the memory card 40 The data (date of manufacture

etc.) relevant to manufacture of the card for whether they are block sizes, such as a hybrid of a lead and the light possibility of, and both types, the block count, the total block count, and security correspondence, etc. are recorded.

[0048]What is called a flash memory produces degradation of an insulator layer by rewriting data, and the number of times of rewriting is restricted. Therefore, it is necessary to prevent access from being repeatedly made intensively to a certain same storage area (block). Therefore, when rewriting the data of a certain logical address stored in a certain physical address, in the file system of a flash memory. It is made as [write / without carrying out writing in again the data updated to the same block / the data updated to the intact block]. As a result, it changes in after the correspondence relation between a logical address and a physical address before renewal of data updating. Access is prevented from being repeatedly carried out intensively by performing such processing (swap processing is called) to the same block, and it becomes possible to prolong the life of a flash memory.

[0049]Since the data once written in to the block is accompanied, even if the block with which the data before updating and the data after updating are written in moves, from FAT, the same address of a logical address can be seen and it can perform subsequent accesses properly. Since the correspondence relation between a logical address and a physical address changes with swap processings, the logic-physical address translation table showing both correspondence is needed. By referring to this table, access to the block which the physical address corresponding to the logical address specified by FAT is specified, and the specified physical address shows is attained.

[0050]A logic-physical address translation table is stored by DSP30 on SRAM 31 and 36. When there is little RAM capacity, it can store in the flash memory 42. This table is a table which made the physical address (2 bytes) correspond to the logical address (2 bytes) arranged in the ascending order roughly, respectively. Since the maximum capacity of the flash memory 42 is 128 MB (8192 blocks), 2 bytes can express the address of 8192. A logic-physical address translation table is managed for every segment, and the size becomes large according to the capacity of the flash memory 42. For example, in the case where the capacity of the flash memory 42 is 8 MB (two segments), 2 pages is used for logic-physical address translation tables to each of two segments. When a logic-physical address translation table is stored in the flash memory 42, it is directed by predetermined 1 bit of the management flag in the redundancy part of each page mentioned above whether the block concerned is the block with which the logic-physical address translation table is stored.

[0051]It is usable by the FAT filesystem of a personal computer like a disk shape recording medium in the memory card 40 mentioned above. Although not shown in drawing 5, an IPL field, a FAT area, and a root directory field are provided on the flash memory 42. The variety of information of the address with which the program which should be first loaded to the memory of the recorder 1 is written, and the memory is written to the IPL field. The related matters of the block (cluster) are written to the FAT area. The value which shows an intact block, the following block number and a defective block, and the last block, respectively is specified in FAT. Directory entries (a file attribute, an updating date, a start cluster, a file size, etc.) are written to the root directory field.

[0052]He is trying to have a playback management file for managing the part which constitutes each track and each track to the file for music separately from the file manager system specified in the format of the memory card 40 mentioned above in this example. This reproduction management file is recorded on the flash memory 42 using the user block of the memory card 40. By it, even if FAT on the memory card 40 breaks, it becomes restorable [a file].

[0053]This reproduction management file is created by DSP30. For example, attestation is performed, when it is judged whether it is equipped with the memory card 40 when one [a power supply] first and it is equipped with the memory card 40. If it is checked by attestation that it is a regular memory card, the boot block of the flash memory 42 will be read into DSP30. And a logic-physical address translation table is read. The read data is stored in SRAM 31 and 36. Also the

memory card 40 used only after a user purchases, FAT and the writing of the root directory are made by the flash memory 42 at the time of shipment. A playback management file will be created if sound recording is made.

[0054]That is, if the sound recording instructions generated by a user's operation etc. are given to DSP30, the audio information which received will be compressed by an encoder / decoder IC10, and ATRAC3 data from an encoder / decoder IC10 will be enciphered by security IC20. And although ATRAC3 data in which DSP30 was enciphered is recorded on the flash memory 42 of the memory card 40, FAT and a reproduction management file are updated after this record. The degree of renewal of a file, and whenever it starts record of audio information and specifically ends record, FAT and a reproduction management file are rewritten on SRAM31 and 36. And when removing the memory card 40, or when power is turned off, final FAT and a reproduction management file are stored on the flash memory 42 of the memory card 40 from SRAM 31 and 36. In this case, whenever it starts record of audio information and ends record, FAT and the reproduction management file on the flash memory 42 may be rewritten. Also when it edits, the contents of a reproduction management file are updated.

[0055]In the data configuration of this example, additional information is also created and updated in a reproduction management file, and it is recorded on the flash memory 42. Apart from a reproduction management file, an additional information management file may be made to be created. Additional information is given to DSP30 via a bus and the bus interface 32 from an external controller. The additional information which DSP30 received is recorded on the flash memory 42 of the memory card 40. Since it does not pass along security IC20, additional information is not enciphered. Additional information removes the memory card 40, or is written in the flash memory 42 from SRAM of DSP30 at the time of power OFF.

[0056]3-2 Directory configuration drawing 6 shows the directory configuration of the memory card 40. The directory for still pictures, the directory for animations, the directory for sounds, the directory for control, and the directory for music (HIFI) are formed from a root directory so that it may illustrate. By this example, since it explains focusing on musical record/playback, the directory for music is explained hereafter. Two kinds of files are put on the directory for music. One of them is reproduction management file PBLIST.MSF (it is only hereafter written as PBLIST), and other things consist of ATRAC3 data-file A3Dnnnn.MSA (it is only hereafter written as A3D nnn) which stored the enciphered music data. ATRAC3 data file is prescribed that the maximum number is to 400. After registering ATRAC3 data file into a reproduction management file, it is arbitrarily created by apparatus.

[0057]3-3 Managing structure and edit method drawing 7 show the composition of a reproduction management file, and drawing 8 shows the composition of one ATRAC3 data file (one music). A reproduction management file is a file of 16KB fixed length. As shown in drawing 7, a reproduction management file consists of additional information INF-S of the reproduction table TRKTBL of name NM1-S of the memory card of a header and a single byte code, name NM2-S of the memory card of a 2-byte code, and playing order, and the whole memory card.

[0058]ATRAC3 data file (only henceforth a data file) shown in drawing 8 is equivalent to the program (or contents) as used in the field of this invention, and is a file of a music unit. And a data file consists of a top attribute header and enciphered actual music data following it. An attribute header is made into 16-KB fixed length, and has a reproduction management file and similar composition. The attribute header of the head of a data file consists of track information TRKINF(s), such as track name NM2 of 1 or 2 bytes of track name NM code of a header and a single byte code, and key information on a track, part information PRTINF, and additional information INF of a track. The information on the total number of multipart forms, the attribute of a name, and the size of additional information, etc. are included in a header.

[0059]In this data file, the music data of ATRAC3 continues to an attribute header. Music data is divided for 16 KB of every block, and the header is added to the head of each block. The initial value

for decoding a code is included in a header. Only the music data in ATRAC3 data file receives processing of encryption, and the data of the other reproduction management file, a header, etc. is not enciphered.

[0060]With reference to drawing 9, the relation between music (contents) and ATRAC3 data file is explained. One contents mean the data constellation managed as one music. One music comprises one ATRAC3 data file (refer to drawing 8). The audio information into which ATRAC3 data file was compressed by ATRAC3 is recorded.

[0061]To the memory card 40, record of data is performed in the unit called a cluster. One cluster is 16 KB in capacity. Two or more files do not mix with this one cluster. The minimum unit when eliminating the flash memory 42 is 1 block. In the case of the memory card 40 used for recording music data, a block and a cluster are convertible terms and are defined as 1 cluster =1 sector.

[0062]Although one music comprises one part fundamentally, when edit is performed, one music may comprise two or more parts.A part means the unit of the data recorded by within a time [which continued from a recording start to the stop], and one contents usually comprise one part. When one contents comprise two or more parts, relation of the part in music is managed by part information PRTINF (after-mentioned) in the attribute header of each music. That is, 4 bytes of data called the part size PRTSIZE in PRTINF expresses part size. 2 bytes of the head of the part size PRTSIZE show the total of the cluster which a part has, and the next 1 byte each shows the position of the start sound unit (it is written as SU) in a head and the cluster of an end, and the position of the end SU. By having a describing method of such a part, when editing music data, it becomes possible to usually lose movement of a lot of music data needed. If it limits to edit of a block unit, movement of music data is avoidable similarly, but as compared with SU unit, the edit unit of a block unit is too large.

[0063]SU is the minimum unit of a part and is the minimum data unit when compressing audio information by ATRAC3. Hundreds of bytes of data which compressed into 10 about 1/of audio information for 1024 samples obtained by a 44.1-kHz sampling frequency (1024x16 bits x two channels) is SU. 1SU will be converted into time and will be an about 23-m second. Usually, one part is constituted by SU which attains to thousands. When one cluster comprises 42 SU(s), the sound for about 1 second can be expressed with one cluster. The number of the parts which constitute one contents is influenced by additional information size. Since it is decided by the number excluding a header, a track name, additional information data, etc. out of 1 block, the number of multipart forms serves as conditions for which the state where there is no additional information can use the part of the maximum number (645 pieces).

[0064]Drawing 9 shows the file organization at the time of recording two audio information from CD etc. continuously. The case where the 2nd (data file #2) music is constituted from six clusters (CL5-CL10) by drawing 9 (c) when the 1st (data file #1) music is constituted from five clusters (CL0-CL4) by drawing 9 (a) is shown. Since two files are not allowed to be intermingled in one cluster between the 2nd music with the 1st music, data file #2 is created from the beginning of the following cluster (CL5). Therefore, as the termination (termination of the 1st music) of data file #1 is a cluster, even if it is located, as expanded and shown in drawing 9 (b), data (SU) shall not exist in the remaining portion of the cluster. The 2nd music (data file #2) is the same. And in the case of this example, data file #1 and #2 comprise one part.

[0065]To the data file recorded on the memory card 40, DEBAIDO, a combine, erasion, and four kinds of processings of a move are specified as edit. DEBAIDO is dividing one track into two. If DEBAIDO is carried out, the total one track number will increase. DEBAIDO divides one file on a file system, considers it as two files, and updates a reproduction management file. A combine is combining two tracks with one. If a combine is carried out, the total one track number will decrease. A combine unifies two files on a file system, carries out them to one file, and updates a reproduction management file. Erasion is eliminating a track. One track number after being erased decreases. The move as editing processing is changing track turn. A reproduction management file is updated also in

this case. The "move" as editing processing here is not accompanied by movement of data. For example, a meaning differs from the "move" of the data from recording media, such as HDD, to recording media, such as a memory card. After the move from a recording medium to a recording medium copies data, it is realized by eliminating the data from the recording medium of a copied material.

[0066]The result of having carried out the combine of the two music (data file #1, #2) shown in drawing 9 is shown in drawing 10. By the combine having been carried out, data file #1 and #2 are set to one data file #1, and this data file #1 is formed from two parts. Since there is a describing method about a part in this example as mentioned above, the starting position of the part 1, the end position of the part 1, the starting position of the part 2, and the end position of the part 2 can be specified to the result (drawing 10) of having carried out the combine, per SU, respectively. As a result, in order to pack the crevice between the knots of the result which carried out the combine, it is not necessary to move the music data of the part 2.

[0067]Drawing 11 shows the result, DEBAIDO [one music (data file #1) of drawing 9 (a)] in the middle of the cluster 2. By DEBAIDO, data file #2 which consists of cluster CL3 and CL4 data file #1 which consists of a front side of cluster CL0, CL1, and cluster CL2, and the backside of cluster CL2 (CL11) occurs. Since two files are not allowed to be intermingled in one cluster as mentioned above, in the DEBAIDO edit which makes a division point a certain position in cluster CL2 in this way, it is first copied to cluster CL11 [another] in which the data of cluster CL2 has opened. And the position equivalent to the division point in cluster CL11 is made into the starting point, and it is made for cluster CL3 and CL4 to follow the cluster CL11 in data file #2. Therefore, in DEBAIDO edit, it is necessary to newly use not only the renewal of a reproduction management file but one cluster.

[0068]Since there is a describing method about a part as mentioned above, it is not necessary to move data so that the opening of the head (cluster CL11) of data file #2 may be filled in the result (drawing 11), DEBAIDO.

[0069]3-4 Reproduction management file drawing 12 shows the more detailed data configuration of the reproduction management file PBLIST. The reproduction management file PBLIST is the size of one cluster (1 block = 16 KB). Let 32 bytes of a head be a header. Name NM1-S [as opposed to the whole memory card in portions other than a header] (256 bytes), name NM2-S (512 bytes), CONTENTS KEY, MAC, and S-YMDhms, It is additional information INF-S (14720 bytes) to the whole table TRKTBL (800 bytes) and memory card which manage reproduction order, and, finally a part of information in a header is recorded again. It is specified that each head of these different kinds of data constellations serves as a position within a reproduction management file.

[0070]In a reproduction management file, 32 bytes is a header from the head expressed with (0x0000) and (0x0010). The unit divided per 16 bytes from the head in the file is called a slot. The data which has a following meaning, a function, and a value in the header allotted to the 1st and 2nd slots of a reproduction management file is arranged sequentially from a head. The data Reserved [data] is written expresses the data of the undefined. Usually, although a null (0x00) is written, the data of Reserved is disregarded whatever it may be written. There may be change in a future version. The writing to this portion forbids. When [all] not using the portion written to be Option, either, it is considered as the same treatment as Reserved.

[0071]BLKID-tangent line0 (4 bytes)

semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of a reproduction management file.

Value: Fixed value ="tangent line=0" (for example, 0x544C2D30)

MCode (2 bytes)

Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.

Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks

REVISION (4 bytes)
Meaning: The number of times of rewriting of a reproduction management file (PBLIST).
Function: Whenever it rewrites a reproduction management file, **********.
Value: Start from zero and increase every [1 / +].
[0072]SN1 C+L (2 bytes)
Meaning: Express the attribute of the name (1 byte) of the memory card written to a NM1-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: A character code (C) distinguishes a character as follows at top 1 byte.
00: Don't set up a character code. It treats as a mere binary number.
01: ASCII 02:ASCII+KANA 03:modifided8859-181:MS-JIS 82:KS C 5601-1989 83:GB2312-80 90:S-JIS(for Voice).
A linguistic code (L) is EBU Tech 3258 as follows in 1 byte of low rank. Language is distinguished according to regulation.
00: Don't set up. When there is no 08:German 09:English 0 A:Spanish0 F:French 15:Italian 1 D:Dutch65:Korean 69:Japanese 75:Chinese data, it is considered as all zero.
[0073]SN2 C+L (2 bytes)
Meaning: Express the attribute of the name (2 bytes) of the memory card written to a NM2-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: The same as that of SN1 C+L mentioned above.
SINFSIZE (2 bytes)
Meaning: Express the size which totaled all the additional information about the whole memory card written to an INF-S field.
Function: The size of a 16-byte unit describes data size, and when there is nothing, certainly consider it as all zero.
Value: Size is 0x39C (924) from 0x0001.
[0074]T-TRK (2 bytes)
semantic : -- TOTAL TRACK NUMBER function: -- the total track number.
Value: When there are not 1 to 0x0190 (a maximum of 400 tracks) and data, consider it as all zero.
VerNo (2 bytes)
Meaning: The version number of a format.
Function: A higher rank is a major version number and a low rank is a minor version number.
Value: Example 0x0100 (Ver1.0)
0x0203(Ver2.3)
[0075]The data written to the field following the header mentioned above is as follows.
[0076]NM1-S meaning: 1 byte of name about the whole memory card.
Function: Variable-length name data which expressed with 1 byte of character code (being the maximum 256). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- various character code NM2-S meaning: -- 2 bytes of name about the whole memory card.

Function: Variable-length name data which expressed with 2 bytes of character code (being the maximum 512). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0077]CONTENTS KEY meaning: The value prepared for every music.
It is saved after being protected by MG (M). Here, it becomes the same value as CONTENTS KEY attached to the 1st music.

Function: It becomes a key required for calculation of MAC of S-YMDhms.
Value: Up to 0 to 0xFFFFFFFFFFFFFFFF.
MAC meaning: -- copyright information alteration check value function: -- up to value value:0 to 0xFFFFFFFFFFFFFFFF created from the contents and CONTENTS KEY of S-YMDhms.
[0078]TRK-nnn meaning: The SQN (sequence) number of ATRAC3 data file to reproduce
Function: Describe FNo in TRKINF.
Value: From 1 to 400 (0x190)
When a track does not exist, it is considered as all zero.
INF-S meaning: Additional information data about the whole memory card (for example, information, including a photograph, words, description, etc.)
Function: Variable-length additional information data accompanied by a header.
Several different additional information may be put in order. ID and data size are attached to each. The additional information data containing each header is constituted from a minimum of 16 bytes or more by the unit of 4 bytes of integral multiple. The value for which the details are mentioned later: It is an additional information data configuration Reference S-YMDhms (4 bytes) (Option)
semantic : -- the time of year, moon, and day - recorded by apparatus with a reliable clock - part and second function: -- indispensable at the time of the value for identifying the last recording date, and EMD.
Value: 25-31 bits Year 0-99 (1980-2079)
21-24 bits Moon Zero to 1216-20 bits Day Zero to 3111-15 bits At the time Zero to 2305-10 bits Part Zero to 5900-04 bits Second 0-29 (two second bits).
[0079]As a slot of the last of a reproduction management file, the BLKID-tangent line0 [same] as the thing in a header, MCode, and REVISION are written.
[0080]For example, when it was extracted while the memory card recorded, or a power supply may be shut off and it revives as noncommercial audio equipment, to detect generating of these abnormalities is needed. REVISION is written in the head and end of a block, and whenever it rewrites this value, he is trying to ********** it +one time, as mentioned above. Therefore, if abnormal termination occurs in the middle of a block, the value of REVISION of a head and an end is not in agreement, and abnormal termination can be detected. Thus, in two REVISION(s) existing, abnormal termination is detectable with high probability. The warning of a display of an error message, etc. occurs at the time of detection of abnormal termination.
[0081]Since fixed value BLKID-tangent line0 is inserted in a 1 block (16 KB) head part, a fixed value can be used for the rule of thumb of restoration when FAT breaks. That is, if the fixed value of the head of each block is seen, it is possible to distinguish the kind of file. And since this fixed value BLKID-tangent line0 is doubly described to the header of a block, and the end part of a block, it can check that reliability. The same thing of the reproduction management file PBLIST may be recorded doubly.
[0082]ATRAC3 data file is considerable big data volume (for example, the block of thousands may be connected) as compared with a reproduction management file, and about ATRAC3 data file, block number BLOCK SERIAL is attached so that it may mention later. However, if BLOCK SERIAL is not attached after attaching distinction of contents by CONNUM0, since ATRAC3 data file usually existed [two or more files] on the memory card, duplication will occur and it will become difficult to restore it of a file when FAT breaks.
[0083]Similarly, although it does not result by destruction of FAT, it makes a mistake in logic, and when [inconvenient as a file] it is, the manufacturer code (MCode) is recorded on the head and end of the block so that the written-in model of maker can be specified.
[0084]Drawing 13 shows the composition of the additional information data (INF-S) recorded on a reproduction management file. The following header is written to the head of additional information. Variable-length data is written after a header.
[0085]INF meaning: -- FIELD ID function: -- the fixed value which shows the head of additional

information data.
value: -- 0x69ID meaning: -- additional information key code function: -- the classification of additional information is shown.
value: — 0 to 0xFFSIZE meaning: -- size:function [of individual additional information]: -- although data size is free, it must be 4 bytes of integral multiple. A minimum of 16 bytes or more of thing. When remainder comes out from the end of data, it buries by the null (0x00).
Value: From 16 to 14784 (0x39C0)
MCode meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
C+L meaning: It expresses each with 1 byte the character code and linguistic code showing the attribute of the character written to the data area from [from a head] the 12th byte of which function:use is done.
value: — the same DATA meaning: as above-mentioned SN1 C+L — individual additional information data function: — variable length data expresses. The head of live data must always start from the 12th byte, and a minimum of 4 bytes or more of length (size) must always be 4 bytes of integral multiple. When there is remainder from the last of data, it buries by a null (0x00).
Value: It is individually defined by the contents.
[0086]Drawing 14 shows an example of correspondence of the value (0-63) of an additional information key code, and the kind of additional information. the value (0-31) of a key code is assigned to music relations (text) -- the (32-63) -- it is assigned to URL (Uniform Resource Locator) (Web relations). Text, such as an album title, an artist name, and CM, is recorded as additional information.
[0087]Drawing 15 shows an example of correspondence of the value (64-127) of an additional information key code, and the kind of additional information. the value (64-95) of a key code -- path/-- receiving in addition to this and being assigned -- the (96-127) -- it is assigned to control / numerical value, and data relations. For example, additional information is made into TOC-ID in the case of (ID=98). TOC-ID shows the first music number, the last music number, the music number and total performance time, and its music performance time based on the TOC information of CD (compact disk).
[0088]Drawing 16 shows an example of correspondence of the value (128-159) of an additional information key code, and the kind of additional information. The value (128-159) of the key code is assigned to synchronous reproduction relations. EMD (Electronic Music Distribution) in drawing 16 means electronic music distribution.
[0089]The example of the data of additional information is explained with reference to drawing 17. Drawing 17 (a) shows the data configuration of additional information like drawing 13. The additional information by which drawing 17 (b) is set to key code ID=3 is an example of an artist name. It is referred to as SIZE=0x1C (28 bytes), and it is shown that the data length of this additional information containing a header is 28 bytes. C+L is used as the character code C= 0x01, and let it be the linguistic code L= 0x09. According to the regulation mentioned above, this value is a character code of ASCII and shows that it is an English language. And the data of the artist name of "SIMON&GRAFUNKEL" is written from a head that the 12th byte to 1 byte data are also. Since the size of additional information is decided to be 4 bytes of integral multiple, 1 byte of remainder is set to (0x00).
[0090]The additional information by which drawing 17 (c) is set to key code ID=97 is an example of ISRC (International Standard Recording Code: copyright code). It is referred to as SIZE=0x14 (20 bytes), and it is shown that the data length of this additional information is 20 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language, i.e., data is a binary number. And the code of 8 bytes of ISRC is written as data. ISRC shows copyright information (a country, an owner, a sound recording year, a serial number).

[0091]The additional information by which drawing 17 (d) is set to key code ID=97 is an example of sound recording time. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and sound recording time (at a year, the moon, a day, the time a part, a second) is expressed.
[0092]The additional information by which drawing 17 (e) is set to key code ID=107 is an example of a reproduction log. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and a reproduction log (at a year, the moon, a day, the time a part, a second) is expressed. The thing with a reproduction log function records 16 bytes of data for every one reproduction.
[0093]3-5 Data file drawing 18 shows the data array of ATRAC3 data file (A3Dnnnn) in case 1SU is N byte (for example, N= 384 bytes). The block as an attribute header and the block with which music data is actually recorded are shown in drawing 18 as a data file as shown by drawing 8. The byte (0x0000-0x7FF0) of the head of each slot of each block (16x2=32 K byte) is shown in drawing 18.
[0094]As shown in drawing 18, 32 bytes is used as a header from the head of an attribute header, 256 bytes is track name field NM1 (256 bytes), and 512 bytes is track name field NM2 (512 bytes). The following data is written to the header of an attribute header.
[0095]BLKID-HD0 (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data file.
Value: Fixed value ="HD=0" (for example, 0x48442D30)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
[0096]N1 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM1)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM1.
Value: Same Nas SN1 C+L2 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM2)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM2.
Value: The same INFSIZE as SN1 C+L (2 bytes)
semantic : -- size function: which totaled all the additional information about a track -- data size -- the size of a 16-byte unit -- description. When there is nothing, it is certainly considered as all zero.

Value: Size is 0x0000 to 0x3C6 (966).
T-PRT (2 bytes)
semantic : -- total number-of-multipart-forms function: -- the number of multipart forms which constitutes a track is expressed. Usually, 1.
Value: From 1 to 0x285 (645dec)
T-SU (4 bytes)
semantic : -- several total SU(s) ability: -- the actual total SU number in 1 track is expressed. It is equivalent to the performance time of music.

Value: 0x01 to 0x001FFFFFINX (2 bytes) (Option)
semantic : -- relative place function [of INDEX]: -- the pointer in which the head of the portion (characteristic portion) of the rust of music is shown. The position from the head of music is specified by the number which carried out the number of SU 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0 to 0xFFFF (maximum, about 6084 seconds)
XT (2 bytes) (Option)
semantic : -- regeneration time function [of INDEX]: -- the number of SU of the time which should be reproduced from the head specified by INX-nnn is specified by the number carried out 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0x0000:setting [no] up. 0x01 to 0xFFFE(a maximum of 6084 seconds)0xFFFF: Up to the end of music.
[0097]Next, the track name fields NM1 and NM2 in an attribute header are explained.
[0098]NM1 meaning: -- character string function: showing a track name -- 1 byte of character code -- a table -- the track name (it is 256 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- character code NM2 various meaning: -- character string function: showing a track name -- 2 bytes of character code -- a table -- the name data (it is 512 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0099]80 bytes of data which begins from the fixed position (0x0320) of an attribute header is called the track information field TRKINF, and security relations and copy control-related information is mainly managed collectively. The data in TRKINF is explained below according to arrangement order.

[0100]CONTENTS KEY (8 bytes)
Meaning: With the value prepared for every music, after being protected by the security block of a memory card, it is saved.
Function: When reproducing music, it becomes the first first needed key. It is used at the time of C-MAC[n] calculation.
Value: It is C-MAC [n] (8 bytes) to 0 to 0xFFFFFFFFFFFFFFFF.
semantic : -- copyright information alteration check value function: -- the value which hides with the contents of two or more TRKINF(s) including a contents accumulation number, and is created from a sequence number. A hidden sequence number is a sequence number currently recorded on the hiding field of the memory card. The recorder which is not copyright correspondence cannot read a hidden field. The personal computer which carries the application which makes it possible to read the recorder of copyright correspondence for exclusive use or a memory card can access a hidden field.
[0101]A (1 byte)
semantic : -- attribute function [of a part]: -- with reference to value:drawing 19 in which information, including the compressed mode in a part, etc., is shown, it explains below, however, as for the monophonic recording of N= 0 and 1, bit7 specifies 0 and the special Joint mode of only a main signal (L+R) for a sub signal as a monophonic recording by 1. The information on bit2 and 1 may disregard the usual reproduction machine.
[0102]The bit 0 of A forms the information on ON and OFF of an emphasis, the bit 1 forms the information on reproduction SKIP and ordinary reproduction, and the bit 2 forms the information on data section, for example, audio information, and other data of FAX etc. The bit 3 is an undefined. Rate information is prescribed by by combining the bits 4, 5, and 6 like a graphic display. N is a value

of the rate expressed with this triplet, and Namely, mono- (N= 0, 1), The record time (in the case of 64 MB of memory card), the data transfer rate, SU number in 1 block, and the number of bytes of 1SU are shown, respectively about five kinds of modes of LP gas (N= 2), SP (N= 4), EX (N= 5, 6), and HQ (N= 7). As for the bit 7, the mode (0:Dual 1:Joint) of ATRAC3 is shown.
[0103]As an example, 64 MB of memory card is used and the case of an SP mode is explained. There are 3968 blocks in 64 MB of memory card. In an SP mode, since 1SU is 304 bytes, 53SU exists in 1 block. 1SU is equivalent to a second (1024/44100). Therefore, 1 block of transfer rates serve as x(44100/1024) 304x8=104737 bps for x(1024/44100) 53x(3968-16) = 4863-second = 81 minutes.
[0104]LT (1 byte)
Meaning: A reproduction restriction flag (the bit 7 and the bit 6) and a security version (the bit 5 - the bit 0)
Function: Mean that there are limitations about this track.
Value: Bit 7: With no 0= restrictions Bit 6 with 1= restriction: Inside of 0= term 1= expiration bit 5 - the bit 0: Security version 0 (if it is except zero, it will be considered as reproduction inhibit)
FNo (2 bytes)
Meaning: File number
Function: It is a track number when recorded first, and this value pinpoints the position of the value of MAC calculating recorded on the hiding field in a memory card.
Value: From 1 to 0x190 (400)
MG(D) SERIAL-nnn (16 bytes)
Meaning: The serial number of a security block (security IC20) of a recording device.
Function: A peculiar value which is altogether different for every recording device.
Value: From 0 to 0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFCONNUM (4 bytes)
Meaning: Contents accumulation number
Function: It is managed by the security block of a recording device with the peculiar value accumulated for every music. 2 is prepared by 4,200 million music the 32nd power, and it is used for the recorded discernment of music.
[0105]Value: 0 to 0xFFFFFFFF.
[0106]YMDhms-S (4 bytes) (Option)
semantic : -- the time of the reproduction opening day of a track with reproduction restrictions --
function: -- the time to which the reproduction start specified by EMD is permitted.
Value: It is the same as the notation of the time mentioned above.
YMDhms-E (4 bytes) (Option)
semantic : -- the time of the reproduction end date of a track with reproduction restrictions --
function: -- the time which ends the reproducing permission specified by EMD.
Value: It is the same as the notation of the time mentioned above.
MT (1 byte) (Option)
semantic : -- maximum function [of the number of times of a reproducing permission]: -- the maximum reproduction frequency specified by EMD.
value: -- 1 to 0xFF -- when intact, it is 0x00. The value of MT is set to 00 when the value of bit7 of LT is 0.
CT (1 byte) (Option)
semantic : -- reproduction frequency function: -- the number of times actually renewable among the number of times by which the reproducing permission was carried out. A decrement is carried out to a reproductive degree.
value: -- 0x00 - 0xFF -- when intact, it is 0x00. bit7 of LT forbids reproduction, when the value of CT is 00 in 1.
[0107]CC (1 byte)
semantic : -- COPY CONTROL function: -- copy control value: -- as shown in drawing 20, the bits

6 and 7 express copy control information, the bits 4 and 5 express the copy control information about a high-speed digital copy, and the bits 1, 2, and 3 express a copy attribute. The bit 0 is an undefined.
example [of CC]: -- The bit 7 ... 0: -- Copy prohibition and 1:copy permission bit 6 ... 0:original copy. 1: The 1st [or more] generation bit 5, 4...00 : it is shown that they are copy prohibition, the 1st generation of 01:copy, 10:copy good bits 3 and 2, and the contents recorded from the 1001:original source.
010: It is shown that they are the contents copied from LCM.
011: It is shown that they are the contents which carried out the move from LCM.
100 or more: Undefined.
LCM is Licensed Compliant Module, for example, a personal computer, HDD in consumer apparatus, etc. correspond. For example, to the digital sound recording from CD, as for bit3, and (2, 1), 01, (bit5, and 4) becomes 001 or 010, as for (bit7 and 6). [00, and]
[0108]CN (1 byte) (Option)
semantic : -- number-of-times function of copy permission: in the high-speed digital copy HSCMS (High speed Serial Copy ManagementSystem) -- copy[one copy and]-free -- that distinction is extended and it specifies by the number of times. Only in the 1st generation of a copy, it is effective, and subtracts for every copy.
value: -- 00: -- copy prohibition, the number of times of 0xFE: from 01, and the number of times of 0xFF: -- unrestricted.
[0109]In the attribute header in a data file, PRTINF is arranged in when 24 bytes of data which begins from 0x0370 is called the part information field PRTINF for part management following the above track information fields TRKINF and it constitutes one track from two or more parts in order of the time-axis. The data in PRTINF is explained below according to arrangement order.
[0110]PRTSIZE (4 bytes)
semantic : -- part size function: -- the size of a part is expressed. Cluster: 2 bytes (top), start SU:1 byte (higher rank), end SU:1 byte (lowest)
value: -- cluster: -- 1 to 0x1F40 (8000), start SU:0 to 0xA0 (160), and end SU:0 to 0xA0 (160) (however, how to count SU begins from 0, 1, 2, and 0)
PRTKEY (8 bytes)
semantic : -- value function [for enciphering a part]: -- the rule of edit is followed at the time of initial value =0 and edit.
Value: From 0 to 0xFFFFFFFFFFFFFFFFCONNUM0 (4 bytes)
Meaning: The role of ID for making unique the contents accumulation number key function:contents made first.
Value: It is considered as the same value as a contents accumulation number initial value key.
[0111]In the attribute header of ATRAC3 data file, as shown in drawing 18, additional information INF is contained. This additional information is the same as that of additional information INF-S (refer to drawing 12) in a reproduction management file except for the point that the starting position is not fixed. The data of additional information INF begins by making the next of the byte portion (4-byte unit) of the last of one or more parts into a starting position.
[0112]INF meaning: -- additional information data function: about a track -- the variable-length additional information data accompanied by a header. Several different additional information may be put in order. ID and data size are added to each. The additional information data containing each header is the same as additional information INF-S in 4 bytes of unit value:reproduction management file of an integral multiple at a minimum of 16 bytes or more.
[0113]The data of each block with which ATRAC3 data is recorded continues to the above attribute headers. As shown also in drawing 8, a header is added for every block. The data within a block shown in drawing 18 is explained below.
[0114]BLKID-A3D (4 bytes)

semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data.
Value: Fixed value ="A3D" (for example, 0x41334420)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
CONNUM0 (4 bytes)
Meaning: The contents accumulation number made first
function: -- the role of ID for making contents unique -- a value is not changed even if edited.
Value: It is considered as the same value as a contents accumulation number initial value key.
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
BLOCK-SEED (8 bytes)
semantic : -- one key function: for enciphering 1 block -- the value which the head of the block generated the random number with the security block of the recording device, and
**********ed the continuing block +one time. Since a sound cannot be made while [about 1 second] it is equivalent to 1 block if this value is lost, the same thing as a header and a block end is written doubly. A value is not changed even if edited.
Value: It is 8 bytes of random number the first stage.
INITIALIZATION VECTOR (8 bytes)
Meaning: The value of 8 bytes for which the head of the required initial value function:block began from 0 when enciphering and decrypting ATRAC3 data for every block, and the last of the last SU was enciphered as for the following block. The case from the middle of the block [DEBAIDO / block] uses 8 bytes of the last in front of the start SU. A value is not changed even if edited.
value: -- 0 to 0 xFFFFFFFFFFFFFFFFSU-nnn meaning: -- data function [of a sound unit]: -- the data compressed from 1024 samples differs from the number of bytes outputted by compressed mode. A value is not changed even if edited (the time of an SP mode as an example N= 384 bytes).
Value: The data value of ATRAC3.
[0115]In drawing 18, since it is N= 384, 42SU is written to 1 block. Two slots (4 bytes) of a 1-block head are used as a header, and BLKID-A3D, MCode, CONNUM0, and BLOCK SERIAL are doubly written to the last one slot (2 bytes). Therefore, too much 1-block field M byte (set to 16,384-384x42-16x3=208 (byte).), As mentioned above in this, 8 bytes of BLOCK SEED is recorded doubly.
[0116]4. Recording processing 4-1 One or less example of processing and the example of processing at the time of the recording operation of the contents (music) by the recorder 1 of this example are explained. There is not only record of contents data but the generation or updating of a reproduction management file which is the capacity for 1 block (one cluster) record of the contents to the memory card 40, and it completes it so that I may be understood from the explanation mentioned above. Edit of DEBAIDO of contents, a combine, etc. is realized by renewal of a reproduction management file. Let the recording position (absolute address) of the reproduction management file on the memory card 40 be a different position at every writing for renewal of a reproduction management file. When DEBAIDO edit is performed, it is necessary to newly use one cluster (1 block).
[0117]If record of contents is performed from such a situation to all the capacity of a memory card, the creation or updating of the reproduction management file concerning the recording operation becomes impossible. Or if all the capacity of a memory card including contents and a reproduction management file is used up, it will become what cannot perform edit of DEBAIDO etc. after that.

Then, as the capacity of a certain grade is left behind, it is made for record to be completed in this example at the time of recording operation. However, since the capacity of the part of the capacity left behind which can record contents will decrease by such processing, capacity left behind must be made into a suitable quantity.

[0118]When recording the music of average performance time generally, the number of music (the number of contents) of one recording medium (memory card) will be to about 20 music. When FM broadcasting etc. are part[1 hour]-recorded, the data for 1 hour is treated as one contents. A user performs operation of dividing each music, by DEBAIDO from the recorded broadcast. From these situations, the method which makes 20 cluster (20 blocks) part grade the above-mentioned capacity left behind, for example can be considered high [a possibility that about 20 times of DEBAIDO will be performed]. In the state where the contents of ten music (30 minutes) are already recorded, if a 10 more cluster (10 blocks) part grade is statistically made into the above-mentioned capacity left behind, it can be presumed that it can respond to subsequent DEBAIDO edit etc. mostly. Then, according to the number of contents already recorded, the method which sets up the capacity left behind is also considered at the time of a recording start. Or it may be made to set up the capacity left behind from the relation of the average size and full capacity of contents already recorded. Since a possibility of being edited after that several times becomes high when there are few contents and the size of each of those contents is large in a memory card, if it says roughly, it is suitable if the capacity left behind is set up according to the tendency.

[0119]Anyway, in this example, the capacity left behind is set up according to the possibility of the number of times of edit after record.

[0120]DSP30 of the recorder 1 is inputted from the line-in selector 13 or the digital input selector 16, and the processing at the time of recording the data in which encryption processing was performed by the audio encoder / decoder 10 encoding processing and security IC20 on the memory card 40 is shown in drawing 21.

[0121]When record is started, DSP30 is Step F101 first and distinguishes whether contents (data file) are already recorded on the memory card 40 from the management information (reproduction management file) of the memory card 40 with which it is loaded. When one is the memory card 40 in which the data file is not recorded, processing is advanced to Step F102 and "20" is still set to the variable L. This is because the inclusion state of about 20 music can be considered, and a possibility that about 20 times of DEBAIDO will be performed can usually be considered as mentioned above if it puts in another way. Of course, the value "20" is only an example, and the suitable value should be set up according to the capacity of a memory card, etc. It may enable it to fluctuate the value equivalent to this "20" arbitrarily to compensate for whether a user performs his situation and contents of record, for example, edit, repeatedly.

[0122]And at Step F108, a part for 20 clusters (20 blocks) is secured not much as a block in L cluster, i.e., this case. It is the block count as capacity which is a thing here of the capacity which mentioned the block above not much, and which is left behind, that is, is at the end time of record, and should be left behind.

[0123]When one or more data files are already recorded on the memory card 40, processing of DSP30 computes the average file size M of the data file currently followed and recorded on Step F103. This can compute it, if the capacity already used for record of a data file is divided by the number of data files. If the average file size M is computable, the prediction total file N [several] is computed at Step F104 by breaking the full capacity of the memory card 40 by the average file size M. In the prediction total file N [several], when the full capacity of the memory card 40 is used, it is a predicted value of how many data files are recorded.

[0124]And DSP30 distinguishes whether the prediction total file N [several] is below "20" at Step F105. "20" here is used as the number of inclusion music as a general average, and is not limited to "20."

[0125]When the prediction total file N [several] is below "20", it judges that 20 music may be

recorded, and it is Step F106 and the value which subtracted the number of data files already recorded from "20" is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0126]On the other hand, when it is presupposed at Step F105 that it is the prediction total file N [several] over "20", Only the number of the prediction total files N [several] is judged that a data file may be recorded, and the value which subtracted the number of data files already recorded from the prediction total file N [several] at Step F107 is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0127]If a block is set up not much as Step F108, record of the data file by audio information will be started from Step F109. Having mentioned the data file above will be recorded by the block unit.

[0128]During recording operation, it is Step F110, and it is supervising whether except for the block, the recordable remaining capacity in the memory card 40 became zero not much. In Step F111, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. Furthermore, at Step F112, as audio information currently supplied, a file change, i.e., music, changes and it is supervised whether it will shift to record of another data file. This file change, i.e., change of music, becomes possible under supervising the track number information included in that digital data etc., when music is supplied as digital audio data, for example from recording media, such as MD and CD. Even when recording about the analog audio signal from the line-in selector 13, it may be made to judge it as a file change, for example by detection of a silent period, etc.

[0129]When it becomes the end of record at Step F111 before rather than an affirmation result comes out at Step F110, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0130]When the file change about the audio information recorded at Step F112 during recording operation is detected, it is the block with which the audio information to the file change point was recorded, and one data file will be formed. Then, the decrement of the variable L is carried out at Step F113, at the time, if the variable L is larger than "1", it will return to Step F108, and a part for L cluster is secured not much as a block. That is, 1 block of setting out as a block is lessened not much. This is that one data file was recorded and is because it is possible that the possibility of the subsequent number of times of DEBAIDO decreased once. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file from Step F109.

[0131]If a track change is detected 19 times during record, when it is Step F114, it will become the variable L= 0. And this is a case where the continuing audio information is recorded as the 20th music. In this case, since a possibility that DEBAIDO edit will be performed after sound recording will become very low, Although considering only it a block may be kept not much as zero according to becoming the variable L= 0, since the writing of a playback management file is actually needed after sound recording, it is at least at the end time of sound recording, and 1 block must be left behind. Then, when the variable L becomes less than one (that is, 0) at Step F114, it is Step F116 and at least 1 block is secured not much as a block at Step F108 as the variable L= 1. Subsequent edit cannot be performed, if a block is used not much for the writing of the reproduction management file after the end of record in this case and the full capacity of the memory card 40 is consumed by it. So, in Step F115, it is shown that there is a possibility that the edit after the end of record may become impossible to a user. For example, a message to that effect is displayed on the indicator 33. However, since record or edit is still possible when judged as the end of record at Step F111 (i.e., when the block not much recordable besides a block is left behind) before an affirmation result comes out at Step F110 after that, it is not necessary to necessarily perform an alarm display at this time.

[0132]In Step F110, it leaves the block count set up not much as area at the time, and when it is judged that the block recordable on others has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And the reproduction management file about the contents recorded at Step F118 is created (or updating), and recording processing is finished. In this case, the recordable capacity in the memory card 40 is in the state where only the block count set up not much as area is left behind. And the block count as a block is set up not much according to the recorded number of music already being subtracted etc. from the thing [that 20 music is usually recorded], that the number of inclusion music is presumed from the relation between average data size and full capacity, and those numbers of inclusion music to have mentioned above. If music is furthermore divided during record (file change), the decrement of the block count is carried out not much. It is at the end time of record, and the number of times only of edit generally predicted after that at least turns into the block count which is sufficient for making edit possible from these things. Therefore, even when sensing that the user has used up the recordable area of the memory card 40 at the time of contents recording, edit of the number of times which is usually needed at least will be enabled, and does not make a user stop sensing inconvenience. The block count is set up not much as the minimum number of times in the number of times of edit usually needed according to a contents recording situation by the block count being set up not much according to the variable L as mentioned above, and a decrement being carried out during record by one side. This means being seldom what sets up many block counts too much and makes record possible capacity of contents small more than needed by that cause. That is, by the recording processing of this example, if possible, after making it not decrease the storage capacity of contents, the edit needed after that can be changed into the state which can be performed.

[0133]After Step F110 is ended after the block has decreased to 1 block not much as mentioned above, and record is ended by F117, it becomes what is used for record of a reproduction management file, and its block and 1 block carried out not much of all the blocks serve as used at the time. That is, edit is impossible henceforth. (According to the view of this example, in this case, since it is already divided into 20 or the number of music beyond it, it is in the state where there is no necessity for DEBAIDO edit). Then, in such a case, it may be made to perform the warning process explained as Step F115. At the time, the edit prohibition process which repeals editing operation may be performed. When a reproduction management file is not newly recorded on a certain block but an old reproduction management file "is updated" in this case, the block with which the old reproduction management file was recorded turns into a block which can be written in. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Then, in such a case, the above-mentioned warning and an edit prohibition process may be performed as what was restricted to DEBAIDO edit.

[0134]By the way, although explanation of the above processing also explained the block used for the writing of the reproduction management file in Step F118 at the end time of record as what is secured not much as a block at least, It may consider processing of drawing 21 that the block used for the writing of the reproduction management file in Step F118 is secured apart from "blocking not much." In that case, even if Step F110 is ended after the block has decreased to 1 block not much as mentioned above, record is ended by F117 and record of a reproduction management file is performed, a block and 1 block carried out are left behind not much. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Since the block with which the old reproduction management file was recorded is also can be written in when a reproduction management file is updated, 2 blocks can be written in and DEBAIDO is also possible. Therefore, as for the above-mentioned alarm display or an edit prohibition process, it is preferred to carry out according to these situations.

[0135]Although it was made for the block count to decrease simply not much in the example of processing of drawing 21 according to the file change, As block setting out is performed including the data file formed by the audio information to the timing of a file change just because it responded

to the average file size and full capacity like Steps F103-F107, it may be made for setting out of the block to change not much.

[0136]4-2 Continue example of processing 2 and drawing 22 explains the recording processing as the example 2 of processing. In drawing 22, about the same processing as above-mentioned drawing 21, the same step number is attached as Steps F101-F118, and explanation is omitted. That is, as for this example 2 of processing, Steps F100 and F119 - 121 are added to processing of above-mentioned drawing 21.

[0137]In this case, in order to enable a user's edit after record, it enables it to choose whether record possible capacity of contents is increased as much as possible, without seldom taking whether a block is set up and such a thing into consideration. That is, the operational mode which a user makes end recording operation by operation from the final controlling element 39 for example when the recordable block residue except the amount of blocks serves as zero not much, It enables it to choose the operational mode (using-up setting out) which enables continuation of recording operation until a block residue recordable on the memory card 40 serves as zero.

[0138]When a user makes record start without performing using-up setting out, the recording processing of DSP30 turns into the same processing as drawing 21 (F101-F118). However, when it sets up by the user having used up and recording operation is made to start, DSP30 performs processing of Step F119, F120, and F121. That is, record of the data file by audio information is started from Step F119. The data file will be recorded by the block unit.

[0139]And during recording operation, it is Step F120, and it is supervising whether the recordable remaining capacity in the memory card 40 remained, and it became 1 block. In Step F121, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0140]When it becomes the end of record at Step F121 before rather than an affirmation result comes out at Step F120, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0141]In Step F120, it leaves 1 block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And at Step F118, the reproduction management file about the recorded contents is created to the remaining 1 blocks (or updating), and recording processing is finished. In this case, it means that the recordable capacity in the memory card 40 was used for record of the maximum and contents. That is, in this example 2 of processing, if it is a case where the edit after record is not considered, it can be made to carry out by a user's selection at record of contents the maximum use of the capacity of the memory card 40.

[0142]4-3 The example 3 of processing is shown in example of processing 3 drawing 23. This example of processing is what fixed setting out of the block not much, and is an example of a fixed value secured as the block count as a block being recordable not much at least at the end time of record.

[0143]That is, when record is started, DSP30 is Step F201 and sets up a part for x cluster as a block not much as a certain set-up fixed value. And record of the data file by audio information is started from Step F202. The data file is recorded by the block unit.

[0144]And the remaining capacity in which it is Step F203 during recording operation, and the record in the memory card 40 is possible, Supervise [x] whether except for the block, it became zero not much, and in Step F204. Whether the record of 1 or two or more data files which the end of record,

i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0145]When it becomes the end of record at Step F204 before rather than an affirmation result comes out at Step F203, DSP30 is Step F206, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0146]In Step F203, it leaves x block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F205 and DSP30 suspends recording operation compulsorily. And at Step F206, the reproduction management file about the recorded contents is created using one of x blocks (or updating), and recording processing is finished. In this case, it will be in the state where a part set up not much as a block as recordable capacity in the memory card 40 blocked (x-1) was left behind.

[0147]That is, in this example 3 of processing, it is at the end time of record, and blocked capacity is left behind at least (x-1), and subsequent editing becomes possible only for that part. It is good also as a value statistically considered to be appropriate as a value of x set up fixed, for example, and as a user can set up arbitrarily, for example, processing corresponding to the user's situation and contents of record can be performed.

[0148]As mentioned above, although the example as an embodiment of the invention has been explained, the example of an embodiment is an example to the last, and the composition of a recorder, mode of processing, etc. are considered variously. The setting method of the block count can consider various kinds of various modifications not much especially. Although the above-mentioned example explained supposing the contents (program) as audio information, this invention is completely applicable to the contents as a video data similarly. The same may be said of text data and other contents.

[0149]

[Effect of the Invention]While setting up the amount of remainder blocks of requirements on the occasion of recording operation in this invention so that the above explanation may show, If the recordable block residue except the amount of blocks serves as zero not much on a recording medium, in order to try to terminate program documentation operation by program documentation operation, The record possible capacity which is equivalent to the above-mentioned amount of remainder blocks at least after the end of record of a program (contents) is left behind. By and the thing for which the amount of blocks is set up not much as a block used for record of management information, or the edit of a program updated and/or recorded. It is effective in the state where the field used for edit of the writing / renewal of the management information for completing record of a program, or a subsequent program will be secured, that is, record and edit can perform appropriately being securable. What the amount of blocks is set up not much for according to the number of programs currently recorded on the recording medium in the case of the recording operation by a program documentation means, By or the thing to set up according to the average data size of a program and the capacity of a recording medium which are recorded on the recording medium. It can be considered as a suitable quantity corresponding to the program documentation situation of the recording medium, and can avoid that there are not much too many amounts of blocks to reduce program recording regions recklessly, and amount of blocks sufficient for subsequent edit etc. cannot be secured conversely.

[0150]If a recordable block residue becomes below predetermined in a recording medium, a user can be notified of a situation with outputting the warning of editing processing about the program currently recorded on the recording medium being made improper.

[0151]The operational mode which will terminate program documentation operation if the block residue in which said record excluding the amount of blocks not much is possible on a recording medium serves as zero, It can make it possible to use the storage capacity of a recording medium effectively according to a user's situation by enabling it to choose the operational mode which enables continuation of program documentation operation until a block residue recordable on a recording medium serves as zero.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention]This invention relates to the recorder which records programs (contents), such as audio information and a video data, on a recording medium, for example.

[Translation done.]

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PRIOR ART

[Description of the Prior Art]The electrically rewritable nonvolatile memory called EEPROM (Electrically Erasable Programmable ROM), Since 1 bit was constituted from two transistors, the occupation area per bit was large and the limit was to make a degree of location high. In order to solve this problem, the flash memory which can realize 1 bit with one transistor with all the bit collective erasure methods was developed. The flash memory is expected as what can be replaced with recording media, such as a magnetic disk and an optical disc.
[0003]The memory card which constituted the flash memory to apparatus enabling free attachment and detachment is also known. If this memory card is used, record/playback equipment, such as digital audio information which change to disk like media, such as the conventional CD (compact disk) and MD (mini disc), and uses a memory card, are realizable.
[0004]And in the system which carries out record reproduction of the programs (it is also called contents), such as audio information and a video data, by using the memory card using a flash memory as a recording medium. For example, FAT (File Allocation Table) which is a file manager system conventionally used with a personal computer Edit of contents is easily attained by adopting a file system and the device of file management information. For example, if it assumes that the audio information as one musical piece is recorded as one contents, The DEBAIDO edit which divides the contents and is made into two contents, i.e., two music, the combine edit which is made to combine two contents conversely and is made into one contents, i.e., one music, etc. are possible. Thereby, in a user side, it also becomes possible to process arbitrarily the contents recorded on the memory card, and to enjoy them.

[Translation done.]

* NOTICES *

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EFFECT OF THE INVENTION

[Effect of the Invention]While setting up the amount of remainder blocks of requirements on the occasion of recording operation in this invention so that the above explanation may show, If the recordable block residue except the amount of blocks serves as zero not much on a recording medium, in order to try to terminate program documentation operation by program documentation operation, The record possible capacity which is equivalent to the above-mentioned amount of remainder blocks at least after the end of record of a program (contents) is left behind. By and the thing for which the amount of blocks is set up not much as a block used for record of management information, or the edit of a program updated and/or recorded. It is effective in the state where the field used for edit of the writing / renewal of the management information for completing record of a program, or a subsequent program will be secured, that is, record and edit can perform appropriately being securable. What the amount of blocks is set up not much for according to the number of programs currently recorded on the recording medium in the case of the recording operation by a program documentation means, By or the thing to set up according to the average data size of a program and the capacity of a recording medium which are recorded on the recording medium. It can be considered as a suitable quantity corresponding to the program documentation situation of the recording medium, and can avoid that there are not much too many amounts of blocks to reduce program recording regions recklessly, and amount of blocks sufficient for subsequent edit etc. cannot be secured conversely.
[0150]If a recordable block residue becomes below predetermined in a recording medium, a user can be notified of a situation with outputting the warning of editing processing about the program currently recorded on the recording medium being made improper.
[0151]The operational mode which will terminate program documentation operation if the block residue in which said record excluding the amount of blocks not much is possible on a recording medium serves as zero, It can make it possible to use the storage capacity of a recording medium effectively according to a user's situation by enabling it to choose the operational mode which enables continuation of program documentation operation until a block residue recordable on a recording medium serves as zero.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]By the way, it is considered as the system into which the contents as audio information can be edited conventionally, and the mini disc system is known. At this mini disc system, edit of contents has been realized by rewriting what is called TOC data that are the management information which manages contents. And on the mini disc (magneto-optical disc), the program area which records contents, and the management information field which records TOC data are set as according to by predetermined capacity, respectively, and the amount of information of TOC data did not affect the storage capacity of the program (contents). Since it all is [that rewriting of the TOC data in a management information field is only performed, and] even if it repeats edit how many times, this does not affect the storage capacity of a program (contents), either.
[0006]However, if writing is repeated in the same position when it is a flash memory, it is made suitable from there being character in which a memory life is shortened remarkably to move a writing position continuously. For this reason, when the field which records contents in a memory card, and the field which records the management information which manages contents are not pinpointed, for example, it updates management information, new management information is written in a new field, and recording operation which eliminates the old management information is performed. This means that it is necessary to secure only the field which can newly write in ******** management information, when renewal of management information is needed in connection with the recording operation and edit operation of contents. If it puts in another way and there will be no availability more than predetermined, it will be in the state where it becomes what cannot perform renewal of management information, and recording operation is not completed by this, and edit is impossible. In the memory card which performs management of data, etc. by the prescribed unit called block, the amount of 1 block may newly be needed in the cases, such as DEBAIDO edit, for example. If this does not have an availability more than predetermined, either, it means that edit of contents cannot be performed.
[0007]That is, when using the memory card using a flash memory as a recording medium, When the remaining record possible capacity of a memory card becomes less than predetermined by record of contents, there is inconvenience of it becoming impossible to perform renewal of management information required after record and edit about contents currently recorded.

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MEANS

[Means for Solving the Problem]An object in view of such a problem of this invention is for editing processing to enable it renewal of management information according to record of a program (contents), and to perform appropriately.
[0009]For this reason, a recorder of this invention receives a recording medium with which record is performed by a block unit, While setting the amount of remainder blocks of requirements to a program documentation means which blocks and records a program, and a management information recording device which records management information which manages a recorded program on a recording medium, or updates it, By recording operation by a program documentation means, if a recordable block residue except the amount of blocks serves as zero not much on a recording medium, it will have a control means which terminates recording operation by a program documentation means. That is, as a block used for record or updating of management information, and recorded edit of a program, the amount of blocks is set up not much, and recording operation of a program is ended, where capacity set up not much as an amount of blocks is left.
[0010]
[Embodiment of the Invention]Hereafter, the embodiment of the invention is described. According to this embodiment, the memory card which carries the nonvolatile memory (flash memory) as an example of a recording medium is mentioned, and the recorder which can perform record reproduction operation to a memory card as an example of a recorder is mentioned. Although the data as a program (contents) which can be treated in an embodiment has various kinds of things, such as video datas, such as audio information, a video data, and still picture data, text data, and program data, an explanation top shall treat audio information, such as a musical piece. in addition -- making pictures other than digital audio signals, a character, etc. into additional information, even when treating audio information as main contents -- record/-- it becomes refreshable. Explanation is given in the following order.
1. Composition 3. file system [Data file 4. recording processing 4-1 / Example 14-2 of processing / Example 24-3 of processing / Example 3 of processing] 3-1 of composition 2. memory card of recorder Treatment structure and data structure 3-2 directory configuration 3-3 Managing structure and edit method 3-4 Reproduction management file 3-5 [0011]1. The lineblock diagram 1 of a recorder explains the composition of the memory card recording and reproducing device (the following, recorder 1) which can carry out record reproduction of the programs (contents), such as audio information, to a memory card. The memory card which can be detached and attached freely is used for this recorder 1 as a recording medium. And this recorder 1 may be constituted as audio equipment of a simple substance, and may be constituted as an apparatus part built in a personal computer, or an audio / visual apparatus. When you consider it as the audio equipment of a simple substance, let the recorder 1 be a recording and reproducing device of a deferred type or portable small size, for example. In that case, an audio system can also be constituted with an amplifier device, a loudspeaker, a CD player, an MD recorder, a tuner, etc. As a gestalt built in other

apparatus, it is the same positioning as a CD-ROM drive or a floppy disk drive, for example in a personal computer, and can adopt as a memory card drive. It is also possible to build the recorder 1 in a video camera or a game machine machine furthermore, and to use a memory card as a recording medium of a video data or audio information. The recorder 1 is not concerned with the above-mentioned simple substance type and built-in, but can be applied also as a recorder which records the digital audio signals etc. which are distributed via data communications, digital broadcasting, the Internet, etc. which use a satellite.

[0012]Drawing 1 shows the general composition as a memory card recording and reproducing device realizable in the mode of these various kinds. The recorder 1 has the audio encoder / decoder IC10 which comprised a 1 chip IC, respectively, security IC20, and DSP(Digital Signal Processor) 30. And the memory card 40 which can be detached and attached freely is used as a recording medium to the recorder 1. The IC form of the security block with which the memory card 40 includes the enciphering circuit of a flash memory (nonvolatile memory), a memory control block, and DES (Data Encryption Standard) is carried out on 1 chip. In this example, although DSP30 is used, it may replace with DSP and a microcomputer may be used.

[0013]An audio encoder / decoder IC10 have the audio interface 11, and an encoder / decoder block 12. The data which carried out high efficiency coding of an encoder / the decoder block 12 in order to write digital audio signals in the memory card 40, and was read from the memory card 40 is decoded. As a highly efficient encoding method, what (it is written as ATRAC3) improved ATRAC (AdaptiveTransform Acoustic Coding) adopted with the mini disc can be used.

[0014]In ATRAC3, the audio information of 16 bits of one sample sampled at 44.1 kHz is processed. The minimum data unit when processing audio information by ATRAC3 is the sound unit SU. 1SU compresses a part for 1024 samples (1024x16 bits x two channels) into hundreds of bytes, makes it time, and is an about 23-m second. About 1/of audio information is compressed into 10 by ATRAC3. In a mini disc, there is little degradation of the tone quality according to compression/elongation processing by signal processing by which ATRAC3 was devised so that that may be right.

[0015]The line-in selector 13 supplies selectively the reproducing output of MD, the output of a tuner, and a tape reproduction output to A/D converter 14. A/D converter 14 changes the selected line-in signal into digital audio signals of (sampling frequency =44.1kHz and 1 sample =16 bit). The digital input selector 16 supplies selectively the digitized output of MD, CD, and CS (satellite digital broadcasting) to the digital input receiver 17. A digital input is transmitted, for example via an optical cable. The digital input receiver's 17 output is supplied to the sampling rate converter 15, and the sampling frequency of a digital input is changed into 44.1 kHz.

[0016]The coding data obtained by the encoding processing in the encoder / decoder block 12 of an audio encoder / decoder IC10 is supplied to the enciphering circuit 22 of DES via the interface 21 of security IC20. The enciphering circuit 22 of DES has FIFO23. It has for the enciphering circuit 22 of DES to protect the copyright of contents. Although mentioned later, the enciphering circuit of DES is included also in the memory card 40. The enciphering circuit 22 of DES of the recorder 1 has a unique storage key for every apparatus with two or more master keys. The enciphering circuit 22 of DES can have a random number generation circuit, and the memory card 40, the attestation, and the session key which build in the enciphering circuit of DES can be shared. The enciphering circuit 22 of DES can apply a key again by a storage key through the enciphering circuit of DES more nearly further.

[0017]The audio information enciphered from the enciphering circuit 22 of DES is supplied to DSP (Digital Signal Processor) 30. DSP30 performs communication which passes the memory interface 38 shown in drawing 2 between the memory cards 40 with which the attachment-and-detachment mechanism which is not illustrated was equipped, and writes the enciphered data in a flash memory. Serial communication is made between DSP30 and the memory card 40. In order to secure memory space required for control of the memory card 40, external SRAM (Static Random AccessMemory) 31 is connected to DSP30.

[0018]The terminal 32 is connected and it enables it to perform two-way communication of contents data or control data between the external instrument or the external circuit unit which is not illustrated to DSP30 furthermore. DSP30 communicates between external instruments etc. via the interface 37 shown in drawing 2. For example, when this recorder 1 comprises a simple substance, The predetermined communication method should respond, for example to USB, IEEE1394, IEC958, serial port communication, parallel port communication, etc., and communication of the interface 37 and the terminal 32 is enabled between a personal computer, an audio / visual apparatus, etc.

[0019]When this recorder 1 is built in a personal computer, an audio / visual apparatus, etc., the interface 37 and the terminal 32 will take the composition of the internal bus etc. which are connected with the system controller of those apparatus, for example.

[0020]From the apparatus connected to the terminal 32, or a part, various kinds of data is supplied to DSP30. For example, when the recorder 1 is made into the part of an audio system or a computer system, From the system controller of the exterior which controls operation of the whole audio system and computer system, the data of sound recording instructions, a reproduction command, etc. by which it was generated according to a user's operation is given to DSP30. The data of additional information, such as picture information and text, is also supplied to DSP30 via the terminal 32. Furthermore, DSP30 can also supply additional information data, a control signal, etc. which were read from the memory card 40 to an external system controller via the terminal 32.

[0021]The final controlling element 39 in which the operation key etc. to which a user performs various kinds of operations were provided, and the indicator 33 which presents various kinds of information to a user are shown in drawing 1. Especially these are needed when the recorder 1 comprises a simple substance, and when the recorder 1 is built [for example,] in a personal computer, direct continuation of the final controlling element 39 and the indicator 33 does not have to be carried out to DSP30. That is, in the case of a simple substance, although DSP30 will perform processing of the operational input from the final controlling element 39, and display control in the indicator 33, In a built-in case, it is for what is necessary being just to receive the information for which the contents which perform these control, and should supply operation information to DSP30 or the system controller of the device should display on it from DSP30 if needed are shown.

[0022]The audio information enciphered by DSP30 as contents read from the memory card 40 is decrypted by security IC20, and receives the decoding processing of ATRAC3 by an audio encoder / decoder IC10. And the decryption output of an audio encoder / decoder 10 is supplied to D/A converter 18, and is changed into an analog audio signal. And an analog audio signal is taken out by the line-out terminal 19.

[0023]Line-out is transmitted to the amplifier device etc. which are not illustrated, and is reproduced by the loudspeaker or headphone. A muting signal is supplied from an external controller to D/A converter 18. When a muting signal shows one of muting, the audio output from the line-out terminal 19 is forbidden.

[0024]Although drawing 1 shows only the line-out terminal 19, of course, a digital output terminal, a headphone jack, etc. may be provided. The output of the contents data to an external instrument can also be performed via the terminal 32 as mentioned above.

[0025]Drawing 2 shows the internal configuration of DSP30. DSP30 comprises the core 34, the flash memory 35, SRAM36, the interface 37, the memory card interface 38, and a bridge between buses. This DSP30 functions as a microcomputer similarly and the core 34 is equivalent to CPU. The program for processing of DSP30 is stored in the flash memory 35. SRAM36 and SRAM31 of the exterior are used as a work memory for various processing.

[0026]DSP30 answers manipulate signals (or manipulate signal inputted from the final controlling element 39 shown in drawing 1), such as sound recording instructions received via the interface 37, The processing which writes in the enciphered predetermined audio information and predetermined additional information data to the memory card 40, and reads these data from the memory card 40

is controlled. Namely, the application software of the whole audio system for performing record/reproduction of audio information and additional information, DSP30 is located between the memory cards 40 and DSP30 operates with software, such as access of the memory card 40, and a file system.

[0027]The FAT filesystem for which the file management on the memory card 40 in DSP30 is used with the existing personal computer is used. In addition to this file system, by this example, the reproduction management file of a data configuration which is mentioned later is used. A reproduction management file manages the data file currently recorded on the memory card 40. Namely, the reproduction management file as the 1st file management information, Managing the file of audio information, FAT as the 2nd file management information manages the whole file on the flash memory of the memory card 0 including the file and reproduction management file of audio information. A reproduction management file is recorded on the memory card 40. FAT is beforehand written in on the flash memory with the root directory etc. at the time of shipment.

[0028]In this example, in order to protect copyright, the audio information compressed by ATRAC3 is enciphered. It is kept from on the other hand enciphering noting that a management file has unnecessary copyright protection. There may be what has an enciphering function also as the memory card 40, and a thing which it does not have. It is only a memory card with an enciphering function which can use the recorder 1 which records the audio information which is works like this example.

[0029]2. The lineblock diagram 3 of a memory card shows the composition of the memory card 40. As for the memory card 40, the control block 41 and the flash memory 42 are constituted as a 1 chip IC. The bidirectional serial interface between DSP30 of the recorder 1 and the memory card 40 consists of ten lines. Four main lines are with the clock line SCK for transmitting a clock at the time of data communications, status-line SBS for transmitting status, and data-line DIO and interruption line INT that transmit data. In addition, as a line for current supply, two line GND and two VCC lines are formed. The two lines Reserv are lines of the undefined.

[0030]The clock line SCK is a line for transmitting the clock in sync with data. Status-line SBS is a line for transmitting the signal showing the status of the memory card 40. The data line DIO is a line for outputting and inputting a command and the enciphered audio information. Interruption line INT is a line which transmits the interrupt signal which requires interruption to DSP30 of the recorder 1 from the memory card 40. When it equips with the memory card 40, an interrupt signal occurs. However, in this example, since he is trying to transmit an interrupt signal via the data line DIO, interruption line INT has been grounded.

[0031]Serial/parallel conversion, parallel/serial conversion, and the interface block 43 of the control block 41 (it abbreviates to S/P, P/S, and IF block) are the interfaces of DSP30 of the recorder connected via two or more lines mentioned above, and the control block 41. S/P, P/S, and the IF block 43 change into parallel data the serial data received from DSP30 of the recorder 1, are incorporated into the control block 41, change the parallel data from the control block 41 into serial data, and send them to DSP30 of the recorder 1. S/P, P/S, and the IF block 43 separate a command and data, and the command and data required for encryption for the usual access to the flash memory 42, when the command and data which are transmitted via the data line DIO are received.

[0032]That is, in the format transmitted via the data line DIO, a command is transmitted first and data is transmitted after that. S/P, P/S, and the IF block 43 distinguish a command and data required for a usual command and data required for access, and encryption, seeing the code of a command. According to this discriminated result, a command required for the usual access is stored in the command register 44, and data is stored in the page buffer 45 and the light register 46. The error correction code-ized circuit 47 is formed in relation to the light register 46. The error correction code-ized circuit 47 generates the redundancy code of an error correction code to the data temporarily stored in the page buffer 45.

[0033]The output data of the command register 44, the page buffer 45, the light register 46, and the error correction code-ized circuit 47 is supplied to a flash memory interface and the sequencer (it abbreviates to memory I/F and a sequencer) 51. Memory IF and the sequencer 51 are the interfaces of the control block 41 and the flash memory 42, and control an exchange of the data between both. Data is written in the flash memory 42 via memory IF and the sequencer 51.
[0034]The contents (it is written as the audio information compressed by ATRAC3 and following ATRAC3 data) written in the flash memory 42, For copyright protection, it is enciphered by security IC20 of the recorder 1, and the security block 52 of the memory card 40. The security block 52 is provided with the following.
Buffer memory 53.
The enciphering circuit 54 of DES.
Nonvolatile memory 55.

[0035]The security block 52 of the memory card 40 has a unique storage key for every memory card with two or more attestation keys. The nonvolatile memory 55 stores a key required for encryption, and is not visible from the outside. For example, a storage key is stored in the nonvolatile memory 55. It has a random number generation circuit, attestation is possible with the exclusive (meaning in the system with the same use of the existing data format etc. which were decided) recorder 1, and a session key can be shared. It can perform reapplying a key in a storage key through the enciphering circuit 54 of DES more nearly further.
[0036]For example, attestation is made when the recorder 1 is equipped with the memory card 40. Attestation is made by the security block 52 of security IC20 of the recorder 1, and the memory card 40. The recorder 1 will check that a partner is the person himself/herself mutually, if it admits that the memory card 40 with which it was equipped is the person himself/herself (memory card in the same system) and the memory card 40 admits that a partner's recorder is the person himself/herself (recorder in the same system). If attestation is performed, the recorder 1 and the memory card 40 will generate a session key, respectively, and a session key will be shared. A session key is generated by the degree of attestation.
[0037]And at the time of the writing of the contents to the memory card 40, the recorder 1 enciphers a contents key with a session key, and the memory card 40 is passed. In the memory card 40, a contents key is decoded with a session key, it enciphers by a storage key, and the recorder 1 is passed. A storage key is a key unique to each of the memory cards 40, and the recorder 1 will write the contents which performed format processing and were enciphered as the enciphered contents key in the memory card 40, if the enciphered contents key is received.
[0038]At the time of data read-out from the flash memory 42, the read data is supplied to the page buffer 45, the read register 48, and the error correction circuit 49 via memory IF and the sequencer 51. And the data memorized by the page buffer 45 is made for an error correction by the error correction circuit 49. The output of the page buffer 45 and the output of the read register 48 by which the error correction was carried out are supplied to S/P, P/S, and the IF block 43, and are supplied to DSP30 of the recorder 1 via the serial interface mentioned above.
[0039]At the time of such read-out, the contents enciphered with the contents key enciphered by the storage key and the block key are read from the flash memory 42. And by the security block 52, a contents key is decoded by a storage key. It is enciphered with a session key and the contents key furthermore decoded is transmitted to the recorder 1 side. The recorder 1 decodes a contents key with the received session key. The recorder 1 generates a block key by the decoded contents key. With this block key, ATRAC3 enciphered data is decoded one by one.
[0040]The version information of the memory card 40, various kinds of attribution information, etc. are stored in configuration ROM50. The memory card 40 is equipped with the operational switch 60 for erroneous erasure prevention for the user if needed. When this switch 60 is in the connected state of the prohibition on elimination, even if the command which directs to eliminate the flash

memory 42 is sent from the recorder side, elimination of the flash memory 42 is forbidden. The oscillator 61 generates the clock used as the timing basis of processing of the memory card 40.

[0041]3. File system 3-1 Treatment structure and the data structure diagram 4 show the file system processing hierarchy of the system which uses the memory card 40 as a storage. As a file system processing hierarchy, an application process layer is the top and a file management processing layer, a logical address management layer, a physical address management layer, and flash plate memory access set one by one to the bottom of it. In this layered structure, a file management processing layer is a FAT filesystem. The physical address was attached to each block of a flash memory, and the correspondence relation between a block and a physical address is eternal. A logical address is an address which a file management processing layer treats logically.

[0042]Drawing 5 shows an example of the physical configuration of the data of the flash memory 42 in the memory card 40. The data unit by which the flash memory 42 is called a segment is divided to the block (fixed length) of a predetermined number, and 1 block is divided to the page (fixed length) of a predetermined number. In the flash memory 42, it is carried out by elimination bundling up by a block unit, and writing and read-out are performed by bundling up per page.

[0043]Each block and each page are made into the respectively same size, and 1 block is constituted from the page 0 by the page m. It is considered, for example as an 8-KB (K byte) byte or the capacity of 16 KB, and let 1 page 1-block be the capacity of 512B. In the flash memory 42 whole, by the case of 1 block = 8 KB, it is referred to as 4 MB (512 blocks) and 8 MB (1024 blocks), and by the case of 1 block = 16 KB. It is considered as the capacity of 16 MB (1024 blocks), 32 MB (2048 blocks), and 64 MB (4096 blocks).

[0044]1 page consists of 512 bytes of data divisions, and 16 bytes of redundancy parts. Let 3 bytes of the head of a redundancy part be an over-writing portion rewritten according to renewal of data. Block status, page status, and updating status are recorded on 3 bytes of each byte sequentially from a head. 13 bytes of contents of the remainder of a redundancy part are considered as immobilization according to the contents of the data division in principle. These 13 bytes consist of a management flag (1 byte), a logical address (2 bytes), the fields (5 bytes) of format reserve, distributed information ECC (2 bytes), and data ECC (3 bytes). Distributed information ECC is redundant data for error corrections to a management flag, a logical address, and format reserve, and data ECC is redundant data for error corrections to 512 bytes of data.

[0045]As a management flag, it is a system flag (the value and). [1-:-user-] 0: Each flag of a boot block, a translation table flag (1: invalidity, 0:table block), copy prohibition specification (1:O.K., 0:NG), and an access permit (1:free, 0: lead protection) is recorded.

[0046]Two blocks 0 of the head in a segment, i.e., a block, and the block 1 are boot blocks. The block 1 is an object for backup to which the same data as the block 0 is written. A boot block is a leading block of the effective block in the memory card 40, and when apparatus is loaded with the memory card 40, it is a block accessed first. The remaining block is a user block. A header, a system entry, and boot & attribute information are stored in the page 0 of the head of a boot block. Disable block data is stored in the page 1. CIS (Card Information Structure)/IDI (Identify Drive Information) is stored in the page 2.

[0047]The number of entries effective [the header of a boot block] in boot block ID and a boot block is recorded. The starting position of disable block data, its data size, a data type, the data starting position of CIS/IDI, its data size, and a data type are recorded on a system entry. boot & attribute information -- the type (read-only.) of the memory card 40 The data (date of manufacture etc.) relevant to manufacture of the card for whether they are block sizes, such as a hybrid of a lead and the light possibility of, and both types, the block count, the total block count, and security correspondence, etc. are recorded.

[0048]What is called a flash memory produces degradation of an insulator layer by rewriting data, and the number of times of rewriting is restricted. Therefore, it is necessary to prevent access from being repeatedly made intensively to a certain same storage area (block). Therefore, when rewriting

the data of a certain logical address stored in a certain physical address, in the file system of a flash memory. It is made as [write / without carrying out writing in again the data updated to the same block / the data updated to the intact block]. As a result, it changes in after the correspondence relation between a logical address and a physical address before renewal of data updating. Access is prevented from being repeatedly carried out intensively by performing such processing (swap processing is called) to the same block, and it becomes possible to prolong the life of a flash memory.

[0049]Since the data once written in to the block is accompanied, even if the block with which the data before updating and the data after updating are written in moves, from FAT, the same address of a logical address can be seen and it can perform subsequent accesses properly. Since the correspondence relation between a logical address and a physical address changes with swap processings, the logic-physical address translation table showing both correspondence is needed. By referring to this table, access to the block which the physical address corresponding to the logical address specified by FAT is specified, and the specified physical address shows is attained.

[0050]A logic-physical address translation table is stored by DSP30 on SRAM 31 and 36. When there is little RAM capacity, it can store in the flash memory 42. This table is a table which made the physical address (2 bytes) correspond to the logical address (2 bytes) arranged in the ascending order roughly, respectively. Since the maximum capacity of the flash memory 42 is 128 MB (8192 blocks), 2 bytes can express the address of 8192. A logic-physical address translation table is managed for every segment, and the size becomes large according to the capacity of the flash memory 42. For example, in the case where the capacity of the flash memory 42 is 8 MB (two segments), 2 pages is used for logic-physical address translation tables to each of two segments. When a logic-physical address translation table is stored in the flash memory 42, it is directed by predetermined 1 bit of the management flag in the redundancy part of each page mentioned above whether the block concerned is the block with which the logic-physical address translation table is stored.

[0051]It is usable by the FAT filesystem of a personal computer like a disk shape recording medium in the memory card 40 mentioned above. Although not shown in drawing 5, an IPL field, a FAT area, and a root directory field are provided on the flash memory 42. The variety of information of the address with which the program which should be first loaded to the memory of the recorder 1 is written, and the memory is written to the IPL field. The related matters of the block (cluster) are written to the FAT area. The value which shows an intact block, the following block number and a defective block, and the last block, respectively is specified in FAT. Directory entries (a file attribute, an updating date, a start cluster, a file size, etc.) are written to the root directory field.

[0052]He is trying to have a playback management file for managing the part which constitutes each track and each track to the file for music separately from the file manager system specified in the format of the memory card 40 mentioned above in this example. This reproduction management file is recorded on the flash memory 42 using the user block of the memory card 40. By it, even if FAT on the memory card 40 breaks, it becomes restorable [a file].

[0053]This reproduction management file is created by DSP30. For example, attestation is performed, when it is judged whether it is equipped with the memory card 40 when one [a power supply] first and it is equipped with the memory card 40. If it is checked by attestation that it is a regular memory card, the boot block of the flash memory 42 will be read into DSP30. And a logic-physical address translation table is read. The read data is stored in SRAM 31 and 36. Also the memory card 40 used only after a user purchases, FAT and the writing of the root directory are made by the flash memory 42 at the time of shipment. A playback management file will be created if sound recording is made.

[0054]That is, if the sound recording instructions generated by a user's operation etc. are given to DSP30, the audio information which received will be compressed by an encoder / decoder IC10, and ATRAC3 data from an encoder / decoder IC10 will be enciphered by security IC20. And although

ATRAC3 data in which DSP30 was enciphered is recorded on the flash memory 42 of the memory card 40, FAT and a reproduction management file are updated after this record. The degree of renewal of a file, and whenever it starts record of audio information and specifically ends record, FAT and a reproduction management file are rewritten on SRAM31 and 36. And when removing the memory card 40, or when power is turned off, final FAT and a reproduction management file are stored on the flash memory 42 of the memory card 40 from SRAM 31 and 36. In this case, whenever it starts record of audio information and ends record, FAT and the reproduction management file on the flash memory 42 may be rewritten. Also when it edits, the contents of a reproduction management file are updated.

[0055]In the data configuration of this example, additional information is also created and updated in a reproduction management file, and it is recorded on the flash memory 42. Apart from a reproduction management file, an additional information management file may be made to be created. Additional information is given to DSP30 via a bus and the bus interface 32 from an external controller. The additional information which DSP30 received is recorded on the flash memory 42 of the memory card 40. Since it does not pass along security IC20, additional information is not enciphered. Additional information removes the memory card 40, or is written in the flash memory 42 from SRAM of DSP30 at the time of power OFF.

[0056]3-2 Directory configuration drawing 6 shows the directory configuration of the memory card 40. The directory for still pictures, the directory for animations, the directory for sounds, the directory for control, and the directory for music (HIFI) are formed from a root directory so that it may illustrate. By this example, since it explains focusing on musical record/playback, the directory for music is explained hereafter. Two kinds of files are put on the directory for music. One of them is reproduction management file PBLIST.MSF (it is only hereafter written as PBLIST), and other things consist of ATRAC3 data-file A3Dnnnn.MSA (it is only hereafter written as A3D nnn) which stored the enciphered music data. ATRAC3 data file is prescribed that the maximum number is to 400. After registering ATRAC3 data file into a reproduction management file, it is arbitrarily created by apparatus.

[0057]3-3 Managing structure and edit method drawing 7 show the composition of a reproduction management file, and drawing 8 shows the composition of one ATRAC3 data file (one music). A reproduction management file is a file of 16KB fixed length. As shown in drawing 7, a reproduction management file consists of additional information INF-S of the reproduction table TRKTBL of name NM1-S of the memory card of a header and a single byte code, name NM2-S of the memory card of a 2-byte code, and playing order, and the whole memory card.

[0058]ATRAC3 data file (only henceforth a data file) shown in drawing 8 is equivalent to the program (or contents) as used in the field of this invention, and is a file of a music unit. And a data file consists of a top attribute header and enciphered actual music data following it. An attribute header is made into 16-KB fixed length, and has a reproduction management file and similar composition. The attribute header of the head of a data file consists of track information TRKINF(s), such as track name NM2 of 1 or 2 bytes of track name NM code of a header and a single byte code, and key information on a track, part information PRTINF, and additional information INF of a track. The information on the total number of multipart forms, the attribute of a name, and the size of additional information, etc. are included in a header.

[0059]In this data file, the music data of ATRAC3 continues to an attribute header. Music data is divided for 16 KB of every block, and the header is added to the head of each block. The initial value for decoding a code is included in a header. Only the music data in ATRAC3 data file receives processing of encryption, and the data of the other reproduction management file, a header, etc. is not enciphered.

[0060]With reference to drawing 9, the relation between music (contents) and ATRAC3 data file is explained. One contents mean the data constellation managed as one music. One music comprises one ATRAC3 data file (refer to drawing 8). The audio information into which ATRAC3 data file was

compressed by ATRAC3 is recorded.
[0061]To the memory card 40, record of data is performed in the unit called a cluster. One cluster is 16 KB in capacity. Two or more files do not mix with this one cluster. The minimum unit when eliminating the flash memory 42 is 1 block. In the case of the memory card 40 used for recording music data, a block and a cluster are convertible terms and are defined as 1 cluster =1 sector.
[0062]Although one music comprises one part fundamentally, when edit is performed, one music may comprise two or more parts.A part means the unit of the data recorded by within a time [which continued from a recording start to the stop], and one contents usually comprise one part. When one contents comprise two or more parts, relation of the part in music is managed by part information PRTINF (after-mentioned) in the attribute header of each music. That is, 4 bytes of data called the part size PRTSIZE in PRTINF expresses part size. 2 bytes of the head of the part size PRTSIZE show the total of the cluster which a part has, and the next 1 byte each shows the position of the start sound unit (it is written as SU) in a head and the cluster of an end, and the position of the end SU. By having a describing method of such a part, when editing music data, it becomes possible to usually lose movement of a lot of music data needed. If it limits to edit of a block unit, movement of music data is avoidable similarly, but as compared with SU unit, the edit unit of a block unit is too large.
[0063]SU is the minimum unit of a part and is the minimum data unit when compressing audio information by ATRAC3. Hundreds of bytes of data which compressed into 10 about 1/of audio information for 1024 samples obtained by a 44.1-kHz sampling frequency (1024x16 bits x two channels) is SU. 1SU will be converted into time and will be an about 23-m second. Usually, one part is constituted by SU which attains to thousands. When one cluster comprises 42 SU(s), the sound for about 1 second can be expressed with one cluster. The number of the parts which constitute one contents is influenced by additional information size. Since it is decided by the number excluding a header, a track name, additional information data, etc. out of 1 block, the number of multipart forms serves as conditions for which the state where there is no additional information can use the part of the maximum number (645 pieces).
[0064]Drawing 9 shows the file organization at the time of recording two audio information from CD etc. continuously. The case where the 2nd (data file #2) music is constituted from six clusters (CL5-CL10) by drawing 9 (c) when the 1st (data file #1) music is constituted from five clusters (CL0-CL4) by drawing 9 (a) is shown. Since two files are not allowed to be intermingled in one cluster between the 2nd music with the 1st music, data file #2 is created from the beginning of the following cluster (CL5). Therefore, as the termination (termination of the 1st music) of data file #1 is a cluster, even if it is located, as expanded and shown in drawing 9 (b), data (SU) shall not exist in the remaining portion of the cluster. The 2nd music (data file #2) is the same. And in the case of this example, data file #1 and #2 comprise one part.
[0065]To the data file recorded on the memory card 40, DEBAIDO, a combine, erasion, and four kinds of processings of a move are specified as edit. DEBAIDO is dividing one track into two. If DEBAIDO is carried out, the total one track number will increase. DEBAIDO divides one file on a file system, considers it as two files, and updates a reproduction management file. A combine is combining two tracks with one. If a combine is carried out, the total one track number will decrease. A combine unifies two files on a file system, carries out them to one file, and updates a reproduction management file. Erasion is eliminating a track. One track number after being erased decreases. The move as editing processing is changing track turn. A reproduction management file is updated also in this case. The "move" as editing processing here is not accompanied by movement of data. For example, a meaning differs from the "move" of the data from recording media, such as HDD, to recording media, such as a memory card. After the move from a recording medium to a recording medium copies data, it is realized by eliminating the data from the recording medium of a copied material.
[0066]The result of having carried out the combine of the two music (data file #1, #2) shown in

drawing 9 is shown in drawing 10. By the combine having been carried out, data file #1 and #2 are set to one data file #1, and this data file #1 is formed from two parts. Since there is a describing method about a part in this example as mentioned above, the starting position of the part 1, the end position of the part 1, the starting position of the part 2, and the end position of the part 2 can be specified to the result (drawing 10) of having carried out the combine, per SU, respectively. As a result, in order to pack the crevice between the knots of the result which carried out the combine, it is not necessary to move the music data of the part 2.

[0067]Drawing 11 shows the result, DEBAIDO [one music (data file #1) of drawing 9 (a)] in the middle of the cluster 2. By DEBAIDO, data file #2 which consists of cluster CL3 and CL4 data file #1 which consists of a front side of cluster CL0, CL1, and cluster CL2, and the backside of cluster CL2 (CL11) occurs. Since two files are not allowed to be intermingled in one cluster as mentioned above, in the DEBAIDO edit which makes a division point a certain position in cluster CL2 in this way, it is first copied to cluster CL11 [another] in which the data of cluster CL2 has opened. And the position equivalent to the division point in cluster CL11 is made into the starting point, and it is made for cluster CL3 and CL4 to follow the cluster CL11 in data file #2. Therefore, in DEBAIDO edit, it is necessary to newly use not only the renewal of a reproduction management file but one cluster.

[0068]Since there is a describing method about a part as mentioned above, it is not necessary to move data so that the opening of the head (cluster CL11) of data file #2 may be filled in the result (drawing 11), DEBAIDO.

[0069]3-4 Reproduction management file drawing 12 shows the more detailed data configuration of the reproduction management file PBLIST. The reproduction management file PBLIST is the size of one cluster (1 block = 16 KB). Let 32 bytes of a head be a header. Name NM1-S [as opposed to the whole memory card in portions other than a header] (256 bytes), name NM2-S (512 bytes), CONTENTS KEY, MAC, and S-YMDhms, It is additional information INF-S (14720 bytes) to the whole table TRKTBL (800 bytes) and memory card which manage reproduction order, and, finally a part of information in a header is recorded again. It is specified that each head of these different kinds of data constellations serves as a position within a reproduction management file.

[0070]In a reproduction management file, 32 bytes is a header from the head expressed with (0x0000) and (0x0010). The unit divided per 16 bytes from the head in the file is called a slot. The data which has a following meaning, a function, and a value in the header allotted to the 1st and 2nd slots of a reproduction management file is arranged sequentially from a head. The data Reserved [data] is written expresses the data of the undefined. Usually, although a null (0x00) is written, the data of Reserved is disregarded whatever it may be written. There may be change in a future version. The writing to this portion forbids. When [all] not using the portion written to be Option, either, it is considered as the same treatment as Reserved.

[0071]BLKID-tangent line0 (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of a reproduction management file.
Value: Fixed value ="tangent line=0" (for example, 0x544C2D30)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
REVISION (4 bytes)
Meaning: The number of times of rewriting of a reproduction management file (PBLIST).
Function: Whenever it rewrites a reproduction management file, **********.
Value: Start from zero and increase every [1 / +].

[0072]SN1 C+L (2 bytes)
Meaning: Express the attribute of the name (1 byte) of the memory card written to a NM1-S region.

It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: A character code (C) distinguishes a character as follows at top 1 byte.
00: Don't set up a character code. It treats as a mere binary number.
01: ASCII 02:ASCII+KANA 03:modifided8859-181:MS-JIS 82:KS C 5601-1989 83:GB2312-80 90:S-JIS(for Voice).
A linguistic code (L) is EBU Tech 3258 as follows in 1 byte of low rank. Language is distinguished according to regulation.
00: Don't set up. When there is no 08:German 09:English 0 A:Spanish0 F:French 15:Italian 1 D:Dutch65:Korean 69:Japanese 75:Chinese data, it is considered as all zero.
[0073]SN2 C+L (2 bytes)
Meaning: Express the attribute of the name (2 bytes) of the memory card written to a NM2-S region.
It expresses each with 1 byte the character code and linguistic code which are functioned : used.
Value: The same as that of SN1 C+L mentioned above.
SINFSIZE (2 bytes)
Meaning: Express the size which totaled all the additional information about the whole memory card written to an INF-S field.
Function: The size of a 16-byte unit describes data size, and when there is nothing, certainly consider it as all zero.
Value: Size is 0x39C (924) from 0x0001.
[0074]T-TRK (2 bytes)
semantic : -- TOTAL TRACK NUMBER function: -- the total track number.
Value: When there are not 1 to 0x0190 (a maximum of 400 tracks) and data, consider it as all zero.
VerNo (2 bytes)
Meaning: The version number of a format.
Function: A higher rank is a major version number and a low rank is a minor version number.
Value: Example 0x0100 (Ver1.0)
0x0203(Ver2.3)
[0075]The data written to the field following the header mentioned above is as follows.
[0076]NM1-S meaning: 1 byte of name about the whole memory card.
Function: Variable-length name data which expressed with 1 byte of character code (being the maximum 256). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- various character code NM2-S meaning: -- 2 bytes of name about the whole memory card.

Function: Variable-length name data which expressed with 2 bytes of character code (being the maximum 512). The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0077]CONTENTS KEY meaning: The value prepared for every music.
It is saved after being protected by MG (M). Here, it becomes the same value as CONTENTS KEY attached to the 1st music.
Function: It becomes a key required for calculation of MAC of S-YMDhms.
Value: Up to 0 to 0xFFFFFFFFFFFFFFFF.
MAC meaning: -- copyright information alteration check value function: -- up to value value:0 to 0xFFFFFFFFFFFFFFFF created from the contents and CONTENTS KEY of S-YMDhms.
[0078]TRK-nnn meaning: The SQN (sequence) number of ATRAC3 data file to reproduce
Function: Describe FNo in TRKINF.

Value: From 1 to 400 (0x190)
When a track does not exist, it is considered as all zero.
INF-S meaning: Additional information data about the whole memory card (for example, information, including a photograph, words, description, etc.)
Function: Variable-length additional information data accompanied by a header.
Several different additional information may be put in order. ID and data size are attached to each.
The additional information data containing each header is constituted from a minimum of 16 bytes or more by the unit of 4 bytes of integral multiple. The value for which the details are mentioned later:
It is an additional information data configuration Reference S-YMDhms (4 bytes) (Option)
semantic : -- the time of year, moon, and day - recorded by apparatus with a reliable clock - part and second function: -- indispensable at the time of the value for identifying the last recording date, and EMD.
Value: 25-31 bits Year 0-99 (1980-2079)
21-24 bits Moon Zero to 1216-20 bits Day Zero to 3111-15 bits At the time Zero to 2305-10 bits Part Zero to 5900-04 bits Second 0-29 (two second bits).
[0079]As a slot of the last of a reproduction management file, the BLKID-tangent line0 [same] as the thing in a header, MCode, and REVISION are written.
[0080]For example, when it was extracted while the memory card recorded, or a power supply may be shut off and it revives as noncommercial audio equipment, to detect generating of these abnormalities is needed. REVISION is written in the head and end of a block, and whenever it rewrites this value, he is trying to ********** it +one time, as mentioned above. Therefore, if abnormal termination occurs in the middle of a block, the value of REVISION of a head and an end is not in agreement, and abnormal termination can be detected. Thus, in two REVISION(s) existing, abnormal termination is detectable with high probability. The warning of a display of an error message, etc. occurs at the time of detection of abnormal termination.
[0081]Since fixed value BLKID-tangent line0 is inserted in a 1 block (16 KB) head part, a fixed value can be used for the rule of thumb of restoration when FAT breaks. That is, if the fixed value of the head of each block is seen, it is possible to distinguish the kind of file. And since this fixed value BLKID-tangent line0 is doubly described to the header of a block, and the end part of a block, it can check that reliability. The same thing of the reproduction management file PBLIST may be recorded doubly.
[0082]ATRAC3 data file is considerable big data volume (for example, the block of thousands may be connected) as compared with a reproduction management file, and about ATRAC3 data file, block number BLOCK SERIAL is attached so that it may mention later. However, if BLOCK SERIAL is not attached after attaching distinction of contents by CONNUM0, since ATRAC3 data file usually existed [two or more files] on the memory card, duplication will occur and it will become difficult to restore it of a file when FAT breaks.
[0083]Similarly, although it does not result by destruction of FAT, it makes a mistake in logic, and when [inconvenient as a file] it is, the manufacturer code (MCode) is recorded on the head and end of the block so that the written-in model of maker can be specified.
[0084]Drawing 13 shows the composition of the additional information data (INF-S) recorded on a reproduction management file. The following header is written to the head of additional information. Variable-length data is written after a header.
[0085]INF meaning: -- FIELD ID function: -- the fixed value which shows the head of additional information data.
value: -- 0x69ID meaning: -- additional information key code function: -- the classification of additional information is shown.
value: -- 0 to 0xFFSIZE meaning: -- size function [of individual additional information]: -- although data size is free, it must be 4 bytes of integral multiple. A minimum of 16 bytes or more of thing. When remainder comes out from the end of data, it buries by the null (0x00).

Value: From 16 to 14784 (0x39C0)
MCode meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
C+L meaning: It expresses each with 1 byte the character code and linguistic code showing the attribute of the character written to the data area from [from a head] the 12th byte of which function:use is done.
value: -- the same DATA meaning: as above-mentioned SN1 C+L -- individual additional information data function: -- variable length data expresses. The head of live data must always start from the 12th byte, and a minimum of 4 bytes or more of length (size) must always be 4 bytes of integral multiple. When there is remainder from the last of data, it buries by a null (0x00).
Value: It is individually defined by the contents.
[0086]Drawing 14 shows an example of correspondence of the value (0-63) of an additional information key code, and the kind of additional information. the value (0-31) of a key code is assigned to music relations (text) -- the (32-63) -- it is assigned to URL (Uniform Resource Locator) (Web relations). Text, such as an album title, an artist name, and CM, is recorded as additional information.
[0087]Drawing 15 shows an example of correspondence of the value (64-127) of an additional information key code, and the kind of additional information. the value (64-95) of a key code -- path/-- receiving in addition to this and being assigned -- the (96-127) -- it is assigned to control / numerical value, and data relations. For example, additional information is made into TOC-ID in the case of (ID=98). TOC-ID shows the first music number, the last music number, the music number and total performance time, and its music performance time based on the TOC information of CD (compact disk).
[0088]Drawing 16 shows an example of correspondence of the value (128-159) of an additional information key code, and the kind of additional information. The value (128-159) of the key code is assigned to synchronous reproduction relations. EMD (Electronic Music Distribution) in drawing 16 means electronic music distribution.
[0089]The example of the data of additional information is explained with reference to drawing 17. Drawing 17 (a) shows the data configuration of additional information like drawing 13. The additional information by which drawing 17 (b) is set to key code ID=3 is an example of an artist name. It is referred to as SIZE=0x1C (28 bytes), and it is shown that the data length of this additional information containing a header is 28 bytes. C+L is used as the character code C= 0x01, and let it be the linguistic code L= 0x09. According to the regulation mentioned above, this value is a character code of ASCII and shows that it is an English language. And the data of the artist name of "SIMON&GRAFUNKEL" is written from a head that the 12th byte to 1 byte data are also. Since the size of additional information is decided to be 4 bytes of integral multiple, 1 byte of remainder is set to (0x00).
[0090]The additional information by which drawing 17 (c) is set to key code ID=97 is an example of ISRC (International Standard Recording Code: copyright code). It is referred to as SIZE=0x14 (20 bytes), and it is shown that the data length of this additional information is 20 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language, i.e., data is a binary number. And the code of 8 bytes of ISRC is written as data. ISRC shows copyright information (a country, an owner, a sound recording year, a serial number).
[0091]The additional information by which drawing 17 (d) is set to key code ID=97 is an example of sound recording time. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and sound recording time (at a year, the moon, a day, the time a part, a second) is expressed.
[0092]The additional information by which drawing 17 (e) is set to key code ID=107 is an example of

a reproduction log. It is referred to as SIZE=0x10 (16 bytes), and it is shown that the data length of this additional information is 16 bytes. C+L is set to C= 0x00 and L= 0x00, and it is shown that there is no setting out of a character and a language. And 4 bytes (32 bits) of code is written as data, and a reproduction log (at a year, the moon, a day, the time a part, a second) is expressed. The thing with a reproduction log function records 16 bytes of data for every one reproduction.
[0093]3-5 Data file drawing 18 shows the data array of ATRAC3 data file (A3Dnnnn) in case 1SU is N byte (for example, N= 384 bytes). The block as an attribute header and the block with which music data is actually recorded are shown in drawing 18 as a data file as shown by drawing 8. The byte (0x0000-0x7FF0) of the head of each slot of each block (16x2=32 K byte) is shown in drawing 18.
[0094]As shown in drawing 18, 32 bytes is used as a header from the head of an attribute header, 256 bytes is track name field NM1 (256 bytes), and 512 bytes is track name field NM2 (512 bytes). The following data is written to the header of an attribute header.
[0095]BLKID-HD0 (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data file.
Value: Fixed value ="HD=0" (for example, 0x48442D30)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.
Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +], don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
[0096]N1 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM1)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM1.
Value: Same Nas SN1 C+L2 C+L (2 bytes)
semantic : -- attribute function [of track (track name) data (NM2)]: -- it expresses each with 1 byte the character code and linguistic code which are used for NM2.
Value: The same INFSIZE as SN1 C+L (2 bytes)
semantic : -- size function: which totaled all the additional information about a track -- data size -- the size of a 16-byte unit -- description. When there is nothing, it is certainly considered as all zero.

Value: Size is 0x0000 to 0x3C6 (966).
T-PRT (2 bytes)
semantic : -- total number-of-multipart-forms function: -- the number of multipart forms which constitutes a track is expressed. Usually, 1.
Value: From 1 to 0x285 (645dec)
T-SU (4 bytes)
semantic : -- several total SU(s) ability: -- the actual total SU number in 1 track is expressed. It is equivalent to the performance time of music.
Value: 0x01 to 0x001FFFFFINX (2 bytes) (Option)
semantic : -- relative place function [of INDEX]: -- the pointer in which the head of the portion (characteristic portion) of the rust of music is shown. The position from the head of music is specified by the number which carried out the number of SU 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0 to 0xFFFF (maximum, about 6084 seconds)

XT (2 bytes) (Option)
semantic : -- regeneration time function [of INDEX]: -- the number of SU of the time which should be reproduced from the head specified by INX-nnn is specified by the number carried out 1/4. This is equivalent to time (about 93 m seconds) 4 times the length of the usual SU.
Value: 0x0000:setting [no] up. 0x01 to 0xFFFE(a maximum of 6084 seconds)0xFFFF: Up to the end of music.
[0097]Next, the track name fields NM1 and NM2 in an attribute header are explained.
[0098]NM1 meaning: -- character string function: showing a track name -- 1 byte of character code -- a table -- the track name (it is 256 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 1 bytes or more of null (0x00) is recorded from a head (0x0020) at least.
value: -- character code NM2 various meaning: -- character string function: showing a track name -- 2 bytes of character code -- a table -- the name data (it is 512 at the maximum) of bottom variable length. The end of name data certainly writes in a terminal code (0x00). Size is calculated from this terminal code. When there is no data, 2 bytes or more of null (0x00) is recorded from a head (0x0120) at least.
Value: Various character codes.
[0099]80 bytes of data which begins from the fixed position (0x0320) of an attribute header is called the track information field TRKINF, and security relations and copy control-related information is mainly managed collectively. The data in TRKINF is explained below according to arrangement order.

[0100]CONTENTS KEY (8 bytes)
Meaning: With the value prepared for every music, after being protected by the security block of a memory card, it is saved.
Function: When reproducing music, it becomes the first first needed key. It is used at the time of C-MAC[n] calculation.
Value: It is C-MAC [n] (8 bytes) to 0 to 0xFFFFFFFFFFFFFFFF.
semantic : -- copyright information alteration check value function: -- the value which hides with the contents of two or more TRKINF(s) including a contents accumulation number, and is created from a sequence number. A hidden sequence number is a sequence number currently recorded on the hiding field of the memory card. The recorder which is not copyright correspondence cannot read a hidden field. The personal computer which carries the application which makes it possible to read the recorder of copyright correspondence for exclusive use or a memory card can access a hidden field.
[0101]A (1 byte)
semantic : -- attribute function [of a part]: -- with reference to value:drawing 19 in which information, including the compressed mode in a part, etc., is shown, it explains below, however, as for the monophonic recording of N= 0 and 1, bit7 specifies 0 and the special Joint mode of only a main signal (L+R) for a sub signal as a monophonic recording by 1. The information on bit2 and 1 may disregard the usual reproduction machine.
[0102]The bit 0 of A forms the information on ON and OFF of an emphasis, the bit 1 forms the information on reproduction SKIP and ordinary reproduction, and the bit 2 forms the information on data section, for example, audio information, and other data of FAX etc. The bit 3 is an undefined. Rate information is prescribed by by combining the bits 4, 5, and 6 like a graphic display. N is a value of the rate expressed with this triplet, and Namely, mono- (N= 0, 1), The record time (in the case of 64 MB of memory card), the data transfer rate, SU number in 1 block, and the number of bytes of 1SU are shown, respectively about five kinds of modes of LP gas (N= 2), SP (N= 4), EX (N= 5, 6), and HQ (N= 7). As for the bit 7, the mode (0:Dual 1:Joint) of ATRAC3 is shown.
[0103]As an example, 64 MB of memory card is used and the case of an SP mode is explained. There are 3968 blocks in 64 MB of memory card. In an SP mode, since 1SU is 304 bytes, 53SU

exists in 1 block. 1SU is equivalent to a second (1024/44100). Therefore, 1 block of transfer rates serve as x(44100/1024) 304x8=104737 bps for x(1024/44100) 53x(3968-16) = 4863-second = 81 minutes.
[0104]LT (1 byte)
Meaning: A reproduction restriction flag (the bit 7 and the bit 6) and a security version (the bit 5 - the bit 0)
Function: Mean that there are limitations about this track.
Value: Bit 7: With no 0= restrictions Bit 6 with 1= restriction: Inside of 0= term 1= expiration bit 5 - the bit 0: Security version 0 (if it is except zero, it will be considered as reproduction inhibit).
FNo (2 bytes)
Meaning: File number
Function: It is a track number when recorded first, and this value pinpoints the position of the value of MAC calculating recorded on the hiding field in a memory card.
Value: From 1 to 0x190 (400)
MG(D) SERIAL-nnn (16 bytes)
Meaning: The serial number of a security block (security IC20) of a recording device.
Function: A peculiar value which is altogether different for every recording device.
Value: From 0 to 0xFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFCONNUM (4 bytes)
Meaning: Contents accumulation number
Function: It is managed by the security block of a recording device with the peculiar value accumulated for every music. 2 is prepared by 4,200 million music the 32nd power, and it is used for the recorded discernment of music.
[0105]Value: 0 to 0xFFFFFFFF.
[0106]YMDhms-S (4 bytes) (Option)
semantic : -- the time of the reproduction opening day of a track with reproduction restrictions --
function: -- the time to which the reproduction start specified by EMD is permitted.
Value: It is the same as the notation of the time mentioned above.
YMDhms-E (4 bytes) (Option)
semantic : -- the time of the reproduction end date of a track with reproduction restrictions --
function: -- the time which ends the reproducing permission specified by EMD.
Value: It is the same as the notation of the time mentioned above.
MT (1 byte) (Option)
semantic : -- maximum function [of the number of times of a reproducing permission]: -- the maximum reproduction frequency specified by EMD.
value: -- 1 to 0xFF -- when intact, it is 0x00. The value of MT is set to 00 when the value of bit7 of LT is 0.
CT (1 byte) (Option)
semantic : -- reproduction frequency function: -- the number of times actually renewable among the number of times by which the reproducing permission was carried out. A decrement is carried out to a reproductive degree.
value: -- 0x00 - 0xFF -- when intact, it is 0x00. bit7 of LT forbids reproduction, when the value of CT is 00 in 1.
[0107]CC (1 byte)
semantic : -- COPY CONTROL function: -- copy control value: -- as shown in drawing 20, the bits 6 and 7 express copy control information, the bits 4 and 5 express the copy control information about a high-speed digital copy, and the bits 1, 2, and 3 express a copy attribute. The bit 0 is an undefined.
example [of CC]: -- The bit 7 ... 0: -- Copy prohibition and 1:copy permission bit 6 ... 0:original copy. 1: The 1st [or more] generation bit 5, 4...00 : it is shown that they are copy prohibition, the 1st generation of 01:copy, 10:copy good bits 3 and 2, and the contents recorded from the

1001:original source.
010: It is shown that they are the contents copied from LCM.
011: It is shown that they are the contents which carried out the move from LCM.
100 or more: Undefined.
LCM is Licensed Compliant Module, for example, a personal computer, HDD in consumer apparatus, etc. correspond. For example, to the digital sound recording from CD, as for bit3, and (2, 1), 01, (bit5, and 4) becomes 001 or 010, as for (bit7 and 6). [00, and]
[0108]CN (1 byte) (Option)
semantic : -- number-of-times function of copy permission: in the high-speed digital copy HSCMS (High speed Serial Copy ManagementSystem) -- copy[one copy and]-free -- that distinction is extended and it specifies by the number of times. Only in the 1st generation of a copy, it is effective, and subtracts for every copy.
value: -- 00: -- copy prohibition, the number of times of 0xFE: from 01, and the number of times of 0xFF: -- unrestricted.
[0109]In the attribute header in a data file, PRTINF is arranged in when 24 bytes of data which begins from 0x0370 is called the part information field PRTINF for part management following the above track information fields TRKINF and it constitutes one track from two or more parts in order of the time-axis. The data in PRTINF is explained below according to arrangement order.
[0110]PRTSIZE (4 bytes)
semantic : -- part size function: -- the size of a part is expressed. Cluster: 2 bytes (top), start SU:1 byte (higher rank), end SU:1 byte (lowest)
value: -- cluster: -- 1 to 0x1F40 (8000), start SU:0 to 0xA0 (160), and end SU:0 to 0xA0 (160) (however, how to count SU begins from 0, 1, 2, and 0)
PRTKEY (8 bytes)
semantic : -- value function [for enciphering a part]: -- the rule of edit is followed at the time of initial value =0 and edit.
Value: From 0 to 0xFFFFFFFFFFFFFFFFCONNUM0 (4 bytes)
Meaning: The role of ID for making unique the contents accumulation number key function:contents made first.
Value: It is considered as the same value as a contents accumulation number initial value key.
[0111]In the attribute header of ATRAC3 data file, as shown in drawing 18, additional information INF is contained. This additional information is the same as that of additional information INF-S (refer to drawing 12) in a reproduction management file except for the point that the starting position is not fixed. The data of additional information INF begins by making the next of the byte portion (4-byte unit) of the last of one or more parts into a starting position.
[0112]INF meaning: -- additional information data function: about a track -- the variable-length additional information data accompanied by a header. Several different additional information may be put in order. ID and data size are added to each. The additional information data containing each header is the same as additional information INF-S in 4 bytes of unit value:reproduction management file of an integral multiple at a minimum of 16 bytes or more.
[0113]The data of each block with which ATRAC3 data is recorded continues to the above attribute headers. As shown also in drawing 8, a header is added for every block. The data within a block shown in drawing 18 is explained below.
[0114]BLKID-A3D (4 bytes)
semantic : -- BLOCKID FILE ID function: -- the value for identifying that it is a head of ATRAC3 data.
Value: Fixed value ="A3D" (for example, 0x41334420)
MCode (2 bytes)
Meaning: The code which identifies the maker of the apparatus which MAKER CODE-functioned, : was recorded, and a model.

Value: 10 bits (manufacturer code) of higher ranks 6 bits (model code) of low ranks
CONNUM0 (4 bytes)
Meaning: The contents accumulation number made first
function: -- the role of ID for making contents unique -- a value is not changed even if edited.
Value: It is considered as the same value as a contents accumulation number initial value key.
BLOCK SERIAL (4 bytes)
Meaning: The sequence number attached for every track
Function: Even if the head of a block begins from 0 and increment edit of the following block is carried out every [1 / +]; don't change a value.
Value: Start from zero and it is to 0xFFFFFFFF.
BLOCK-SEED (8 bytes)
semantic : -- one key function: for enciphering 1 block -- the value which the head of the block generated the random number with the security block of the recording device, and **********ed the continuing block +one time. Since a sound cannot be made while [about 1 second] it is equivalent to 1 block if this value is lost, the same thing as a header and a block end is written doubly. A value is not changed even if edited.
Value: It is 8 bytes of random number the first stage.
INITIALIZATION VECTOR (8 bytes)
Meaning: The value of 8 bytes for which the head of the required initial value function:block began from 0 when enciphering and decrypting ATRAC3 data for every block, and the last of the last SU was enciphered as for the following block. The case from the middle of the block [DEBAIDO / block] uses 8 bytes of the last in front of the start SU. A value is not changed even if edited.
value: -- 0 to 0 xFFFFFFFFFFFFFFFFSU-nnn meaning: -- data function [of a sound unit]: -- the data compressed from 1024 samples differs from the number of bytes outputted by compressed mode. A value is not changed even if edited (the time of an SP mode as an example N= 384 bytes).
Value: The data value of ATRAC3.
[0115]In drawing 18, since it is N= 384, 42SU is written to 1 block. Two slots (4 bytes) of a 1-block head are used as a header, and BLKID-A3D, MCode, CONNUM0, and BLOCK SERIAL are doubly written to the last one slot (2 bytes). Therefore, too much 1-block field M byte (set to 16,384-384x42-16x3=208 (byte).), As mentioned above in this, 8 bytes of BLOCK SEED is recorded doubly.
[0116]4. Recording processing 4-1 One or less example of processing and the example of processing at the time of the recording operation of the contents (music) by the recorder 1 of this example are explained. There is not only record of contents data but the generation or updating of a reproduction management file which is the capacity for 1 block (one cluster) record of the contents to the memory card 40, and it completes it so that I may be understood from the explanation mentioned above. Edit of DEBAIDO of contents, a combine, etc. is realized by renewal of a reproduction management file. Let the recording position (absolute address) of the reproduction management file on the memory card 40 be a different position at every writing for renewal of a reproduction management file. When DEBAIDO edit is performed, it is necessary to newly use one cluster (1 block).
[0117]If record of contents is performed from such a situation to all the capacity of a memory card, the creation or updating of the reproduction management file concerning the recording operation becomes impossible. Or if all the capacity of a memory card including contents and a reproduction management file is used up, it will become what cannot perform edit of DEBAIDO etc. after that. Then, as the capacity of a certain grade is left behind, it is made for record to be completed in this example at the time of recording operation. However, since the capacity of the part of the capacity left behind which can record contents will decrease by such processing, capacity left behind must be made into a suitable quantity.
[0118]When recording the music of average performance time generally, the number of music (the number of contents) of one recording medium (memory card) will be to about 20 music. When FM

broadcasting etc. are part[1 hour]-recorded, the data for 1 hour is treated as one contents. A user performs operation of dividing each music, by DEBAIDO from the recorded broadcast. From these situations, the method which makes 20 cluster (20 blocks) part grade the above-mentioned capacity left behind, for example can be considered high [a possibility that about 20 times of DEBAIDO will be performed]. In the state where the contents of ten music (30 minutes) are already recorded, if a 10 more cluster (10 blocks) part grade is statistically made into the above-mentioned capacity left behind, it can be presumed that it can respond to subsequent DEBAIDO edit etc. mostly. Then, according to the number of contents already recorded, the method which sets up the capacity left behind is also considered at the time of a recording start. Or it may be made to set up the capacity left behind from the relation of the average size and full capacity of contents already recorded. Since a possibility of being edited after that several times becomes high when there are few contents and the size of each of those contents is large in a memory card, if it says roughly, it is suitable if the capacity left behind is set up according to the tendency.

[0119]Anyway, in this example, the capacity left behind is set up according to the possibility of the number of times of edit after record.

[0120]DSP30 of the recorder 1 is inputted from the line-in selector 13 or the digital input selector 16, and the processing at the time of recording the data in which encryption processing was performed by the audio encoder / decoder 10 encoding processing and security IC20 on the memory card 40 is shown in drawing 21.

[0121]When record is started, DSP30 is Step F101 first and distinguishes whether contents (data file) are already recorded on the memory card 40 from the management information (reproduction management file) of the memory card 40 with which it is loaded. When one is the memory card 40 in which the data file is not recorded, processing is advanced to Step F102 and "20" is still set to the variable L. This is because the inclusion state of about 20 music can be considered, and a possibility that about 20 times of DEBAIDO will be performed can usually be considered as mentioned above if it puts in another way. Of course, the value "20" is only an example, and the suitable value should be set up according to the capacity of a memory card, etc. It may enable it to fluctuate the value equivalent to this "20" arbitrarily to compensate for whether a user performs his situation and contents of record, for example, edit, repeatedly.

[0122]And at Step F108, a part for 20 clusters (20 blocks) is secured not much as a block in L cluster, i.e., this case. It is the block count as capacity which is a thing here of the capacity which mentioned the block above not much, and which is left behind, that is, is at the end time of record, and should be left behind.

[0123]When one or more data files are already recorded on the memory card 40, processing of DSP30 computes the average file size M of the data file currently followed and recorded on Step F103. This can compute it, if the capacity already used for record of a data file is divided by the number of data files. If the average file size M is computable, the prediction total file N [several] is computed at Step F104 by breaking the full capacity of the memory card 40 by the average file size M. In the prediction total file N [several], when the full capacity of the memory card 40 is used, it is a predicted value of how many data files are recorded.

[0124]And DSP30 distinguishes whether the prediction total file N [several] is below "20" at Step F105. "20" here is used as the number of inclusion music as a general average, and is not limited to "20."

[0125]When the prediction total file N [several] is below "20", it judges that 20 music may be recorded, and it is Step F106 and the value which subtracted the number of data files already recorded from "20" is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0126]On the other hand, when it is presupposed at Step F105 that it is the prediction total file N [several] over "20", Only the number of the prediction total files N [several] is judged that a data file may be recorded, and the value which subtracted the number of data files already recorded from

the prediction total file N [several] at Step F107 is set to the variable L. And at Step F108, a part for L cluster (L blocks) is secured not much as a block.

[0127]If a block is set up not much as Step F108, record of the data file by audio information will be started from Step F109. Having mentioned the data file above will be recorded by the block unit.

[0128]During recording operation, it is Step F110, and it is supervising whether except for the block, the recordable remaining capacity in the memory card 40 became zero not much. In Step F111, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. Furthermore, at Step F112, as audio information currently supplied, a file change, i.e., music, changes and it is supervised whether it will shift to record of another data file. This file change, i.e., change of music, becomes possible under supervising the track number information included in that digital data etc., when music is supplied as digital audio data, for example from recording media, such as MD and CD. Even when recording about the analog audio signal from the line-in selector 13, it may be made to judge it as a file change, for example by detection of a silent period, etc.

[0129]When it becomes the end of record at Step F111 before rather than an affirmation result comes out at Step F110, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.

[0130]When the file change about the audio information recorded at Step F112 during recording operation is detected, it is the block with which the audio information to the file change point was recorded, and one data file will be formed. Then, the decrement of the variable L is carried out at Step F113, at the time, if the variable L is larger than "1", it will return to Step F108, and a part for L cluster is secured not much as a block. That is, 1 block of setting out as a block is lessened not much. This is that one data file was recorded and is because it is possible that the possibility of the subsequent number of times of DEBAIDO decreased once. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file from Step F109.

[0131]If a track change is detected 19 times during record, when it is Step F114, it will become the variable L= 0. And this is a case where the continuing audio information is recorded as the 20th music. In this case, since a possibility that DEBAIDO edit will be performed after sound recording will become very low, Although considering only it a block may be kept not much as zero according to becoming the variable L= 0, since the writing of a playback management file is actually needed after sound recording, it is at least at the end time of sound recording, and 1 block must be left behind. Then, when the variable L becomes less than one (that is, 0) at Step F114, it is Step F116 and at least 1 block is secured not much as a block at Step F108 as the variable L= 1. Subsequent edit cannot be performed, if a block is used not much for the writing of the reproduction management file after the end of record in this case and the full capacity of the memory card 40 is consumed by it. So, in Step F115, it is shown that there is a possibility that the edit after the end of record may become impossible to a user. For example, a message to that effect is displayed on the indicator 33. However, since record or edit is still possible when judged as the end of record at Step F111 (i.e., when the block not much recordable besides a block is left behind) before an affirmation result comes out at Step F110 after that, it is not necessary to necessarily perform an alarm display at this time.

[0132]In Step F110, it leaves the block count set up not much as area at the time, and when it is judged that the block recordable on others has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And the reproduction management file about the contents recorded at Step F118 is created (or updating), and recording processing is finished. In this case, the recordable capacity in the memory card 40 is in the state where only the block count set up not much as area is left behind. And the block count as a block is set up not much according to

the recorded number of music already being subtracted etc. from the thing [that 20 music is usually recorded], that the number of inclusion music is presumed from the relation between average data size and full capacity, and those numbers of inclusion music to have mentioned above. If music is furthermore divided during record (file change), the decrement of the block count is carried out not much. It is at the end time of record, and the number of times only of edit generally predicted after that at least turns into the block count which is sufficient for making edit possible from these things. Therefore, even when sensing that the user has used up the recordable area of the memory card 40 at the time of contents recording, edit of the number of times which is usually needed at least will be enabled, and does not make a user stop sensing inconvenience. The block count is set up not much as the minimum number of times in the number of times of edit usually needed according to a contents recording situation by the block count being set up not much according to the variable L as mentioned above, and a decrement being carried out during record by one side. This means being seldom what sets up many block counts too much and makes record possible capacity of contents small more than needed by that cause. That is, by the recording processing of this example, if possible, after making it not decrease the storage capacity of contents, the edit needed after that can be changed into the state which can be performed.

[0133]After Step F110 is ended after the block has decreased to 1 block not much as mentioned above, and record is ended by F117, it becomes what is used for record of a reproduction management file, and its block and 1 block carried out not much of all the blocks serve as used at the time. That is, edit is impossible henceforth. (According to the view of this example, in this case, since it is already divided into 20 or the number of music beyond it, it is in the state where there is no necessity for DEBAIDO edit). Then, in such a case, it may be made to perform the warning process explained as Step F115. At the time, the edit prohibition process which repeals editing operation may be performed. When a reproduction management file is not newly recorded on a certain block but an old reproduction management file "is updated" in this case, the block with which the old reproduction management file was recorded turns into a block which can be written in. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Then, in such a case, the above-mentioned warning and an edit prohibition process may be performed as what was restricted to DEBAIDO edit.

[0134]By the way, although explanation of the above processing also explained the block used for the writing of the reproduction management file in Step F118 at the end time of record as what is secured not much as a block at least, It may consider processing of drawing 21 that the block used for the writing of the reproduction management file in Step F118 is secured apart from "blocking not much." In that case, even if Step F110 is ended after the block has decreased to 1 block not much as mentioned above, record is ended by F117 and record of a reproduction management file is performed, a block and 1 block carried out are left behind not much. Therefore, a combine, a move, erasion, etc. are possible for the edit realized only by renewal of a reproduction management file. Since the block with which the old reproduction management file was recorded is also can be written in when a reproduction management file is updated, 2 blocks can be written in and DEBAIDO is also possible. Therefore, as for the above-mentioned alarm display or an edit prohibition process, it is preferred to carry out according to these situations.

[0135]Although it was made for the block count to decrease simply not much in the example of processing of drawing 21 according to the file change, As block setting out is performed including the data file formed by the audio information to the timing of a file change just because it responded to the average file size and full capacity like Steps F103-F107, it may be made for setting out of the block to change not much.

[0136]4-2 Continue example of processing 2 and drawing 22 explains the recording processing as the example 2 of processing. In drawing 22, about the same processing as above-mentioned drawing 21, the same step number is attached as Steps F101-F118, and explanation is omitted. That is, as for this example 2 of processing, Steps F100 and F119 - 121 are added to processing of above-

mentioned drawing 21.
[0137]In this case, in order to enable a user's edit after record, it enables it to choose whether record possible capacity of contents is increased as much as possible, without seldom taking whether a block is set up and such a thing into consideration. That is, the operational mode which a user makes end recording operation by operation from the final controlling element 39 for example when the recordable block residue except the amount of blocks serves as zero not much, It enables it to choose the operational mode (using-up setting out) which enables continuation of recording operation until a block residue recordable on the memory card 40 serves as zero.
[0138]When a user makes record start without performing using-up setting out, the recording processing of DSP30 turns into the same processing as drawing 21 (F101-F118). However, when it sets up by the user having used up and recording operation is made to start, DSP30 performs processing of Step F119, F120, and F121. That is, record of the data file by audio information is started from Step F119. The data file will be recorded by the block unit.
[0139]And during recording operation, it is Step F120, and it is supervising whether the recordable remaining capacity in the memory card 40 remained, and it became 1 block. In Step F121, whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.
[0140]When it becomes the end of record at Step F121 before rather than an affirmation result comes out at Step F120, DSP30 is Step F118, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.
[0141]In Step F120, it leaves 1 block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F117 and DSP30 suspends recording operation compulsorily. And at Step F118, the reproduction management file about the recorded contents is created to the remaining 1 blocks (or updating), and recording processing is finished. In this case, it means that the recordable capacity in the memory card 40 was used for record of the maximum and contents. That is, in this example 2 of processing, if it is a case where the edit after record is not considered, it can be made to carry out by a user's selection at record of contents the maximum use of the capacity of the memory card 40.
[0142]4-3 The example 3 of processing is shown in example of processing 3 drawing 23. This example of processing is what fixed setting out of the block not much, and is an example of a fixed value secured as the block count as a block being recordable not much at least at the end time of record.
[0143]That is, when record is started, DSP30 is Step F201 and sets up a part for x cluster as a block not much as a certain set-up fixed value. And record of the data file by audio information is started from Step F202. The data file is recorded by the block unit.
[0144]And the remaining capacity in which it is Step F203 during recording operation, and the record in the memory card 40 is possible, Supervise [x] whether except for the block, it became zero not much, and in Step F204. Whether the record of 1 or two or more data files which the end of record, i.e., a user, directed was completed, when the user performed recording stop operation from the final controlling element 39, it is supervised whether it became that by which record is ended. As audio information currently supplied during record, when a file change is detected, it is the block with which the audio information to the file change point was recorded, and one data file is formed. And subsequent record is performed after making continuing audio information into the head of a new block as a new data file.

[0145]When it becomes the end of record at Step F204 before rather than an affirmation result comes out at Step F203, DSP30 is Step F206, creates the reproduction management file about the recorded contents (or updating), and finishes recording processing. In this case, the recordable capacity in the memory card 40 is in the state still left behind fully for subsequent record or edit.
[0146]In Step F203, it leaves x block count at the time, and when it is judged that the recordable block has been used up, it progresses to Step F205 and DSP30 suspends recording operation compulsorily. And at Step F206, the reproduction management file about the recorded contents is created using one of x blocks (or updating), and recording processing is finished. In this case, it will be in the state where a part set up not much as a block as recordable capacity in the memory card 40 blocked (x−1) was left behind.
[0147]That is, in this example 3 of processing, it is at the end time of record, and blocked capacity is left behind at least (x−1), and subsequent editing becomes possible only for that part. It is good also as a value statistically considered to be appropriate as a value of x set up fixed, for example, and as a user can set up arbitrarily, for example, processing corresponding to the user's situation and contents of record can be performed.
[0148]As mentioned above, although the example as an embodiment of the invention has been explained, the example of an embodiment is an example to the last, and the composition of a recorder, mode of processing, etc. are considered variously. The setting method of the block count can consider various kinds of various modifications not much especially. Although the above-mentioned example explained supposing the contents (program) as audio information, this invention is completely applicable to the contents as a video data similarly. The same may be said of text data and other contents.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a block diagram of the recorder of an embodiment of the invention.
[Drawing 2]It is a block diagram of DSP of the recorder of an embodiment.
[Drawing 3]It is a block diagram showing the composition of the memory card of an embodiment.
[Drawing 4]It is an explanatory view of the composition of the file system processing hierarchy of the memory card in an embodiment.
[Drawing 5]It is an explanatory view of a format of the physical configuration of the data of the memory card of an embodiment.
[Drawing 6]It is an explanatory view of the directory structure of the memory card of an embodiment.
[Drawing 7]It is an explanatory view of the data configuration of the reproduction management file of the memory card of an embodiment.
[Drawing 8]It is an explanatory view of the data configuration of the data file of the memory card of an embodiment.
[Drawing 9]It is an explanatory view of the composition of the data file of an embodiment.
[Drawing 10]It is an explanatory view of the combine editing processing of the data file of an embodiment.
[Drawing 11]It is an explanatory view of the DEBAIDO editing processing of the data file of an embodiment.
[Drawing 12]It is an explanatory view of the composition of the reproduction management file of an embodiment.
[Drawing 13]It is an explanatory view of the composition of the additional information field of the reproduction management file of an embodiment.
[Drawing 14]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 15]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 16]It is an explanatory view of the additional information key code of an embodiment.
[Drawing 17]It is an explanatory view of the concrete data configuration of the additional information in an embodiment.
[Drawing 18]It is an explanatory view of the composition of the data file of an embodiment.
[Drawing 19]It is an explanatory view of "A" of the attribute header of the data file of an embodiment.
[Drawing 20]It is an explanatory view of "CC" of the attribute header of the data file of an embodiment.
[Drawing 21]It is a flow chart of the recording processing of an embodiment.
[Drawing 22]It is a flow chart of the recording processing of an embodiment.
[Drawing 23]It is a flow chart of the recording processing of an embodiment.
[Description of Notations]

1, 1A, and 1B [A memory card and 42 / A flash memory and 52 / Security block] A recorder and 10 An audio encoder / decoder IC, and 20 Security IC, 30 DSP, and 40

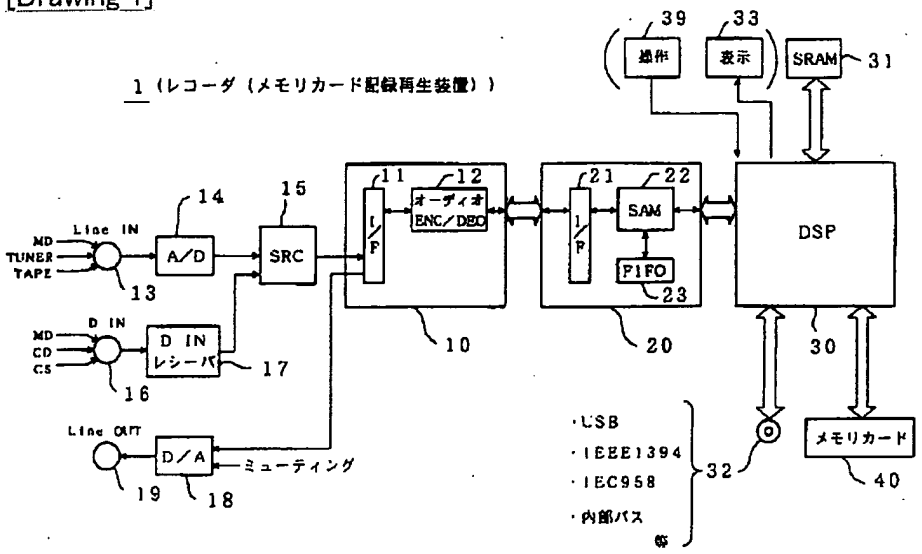
[Translation done.]

* NOTICES *

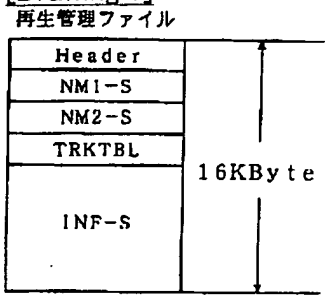
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

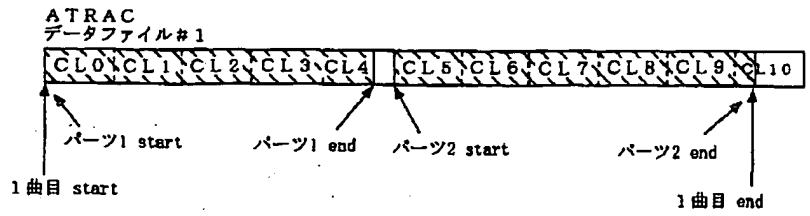
[Drawing 1]



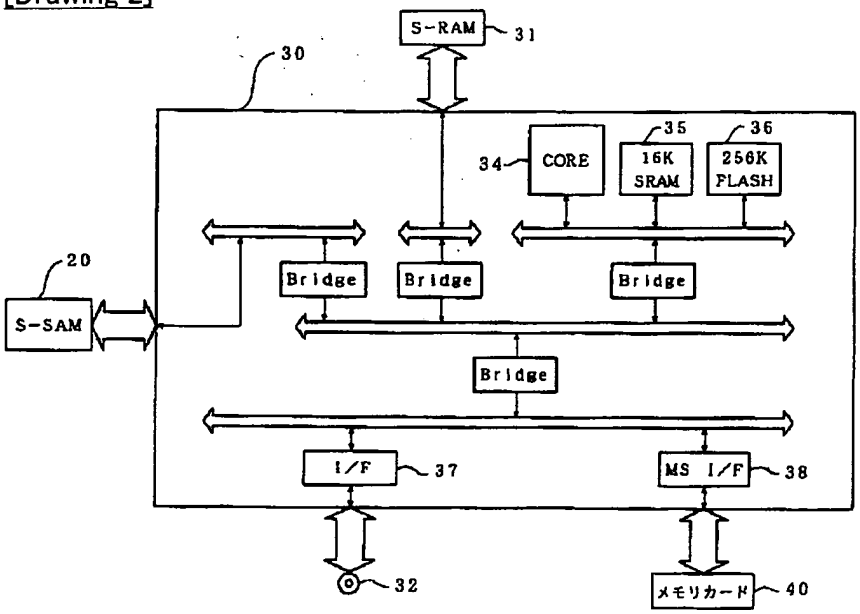
[Drawing 7]



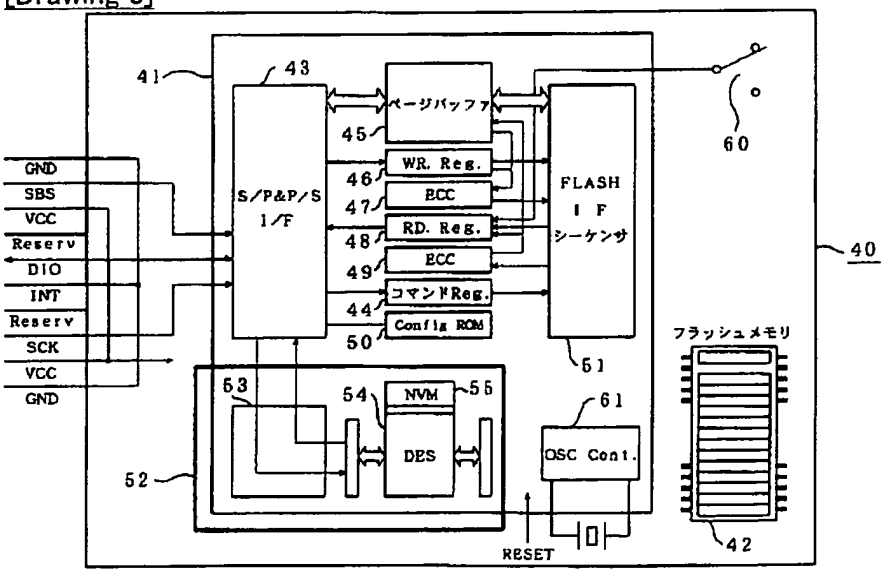
[Drawing 10]



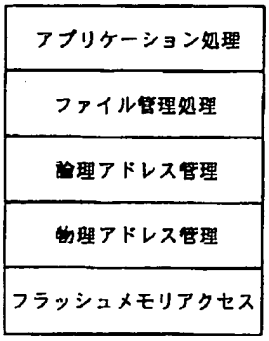
[Drawing 2]



[Drawing 3]

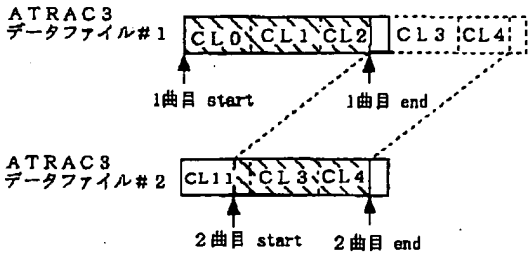


[Drawing 4]

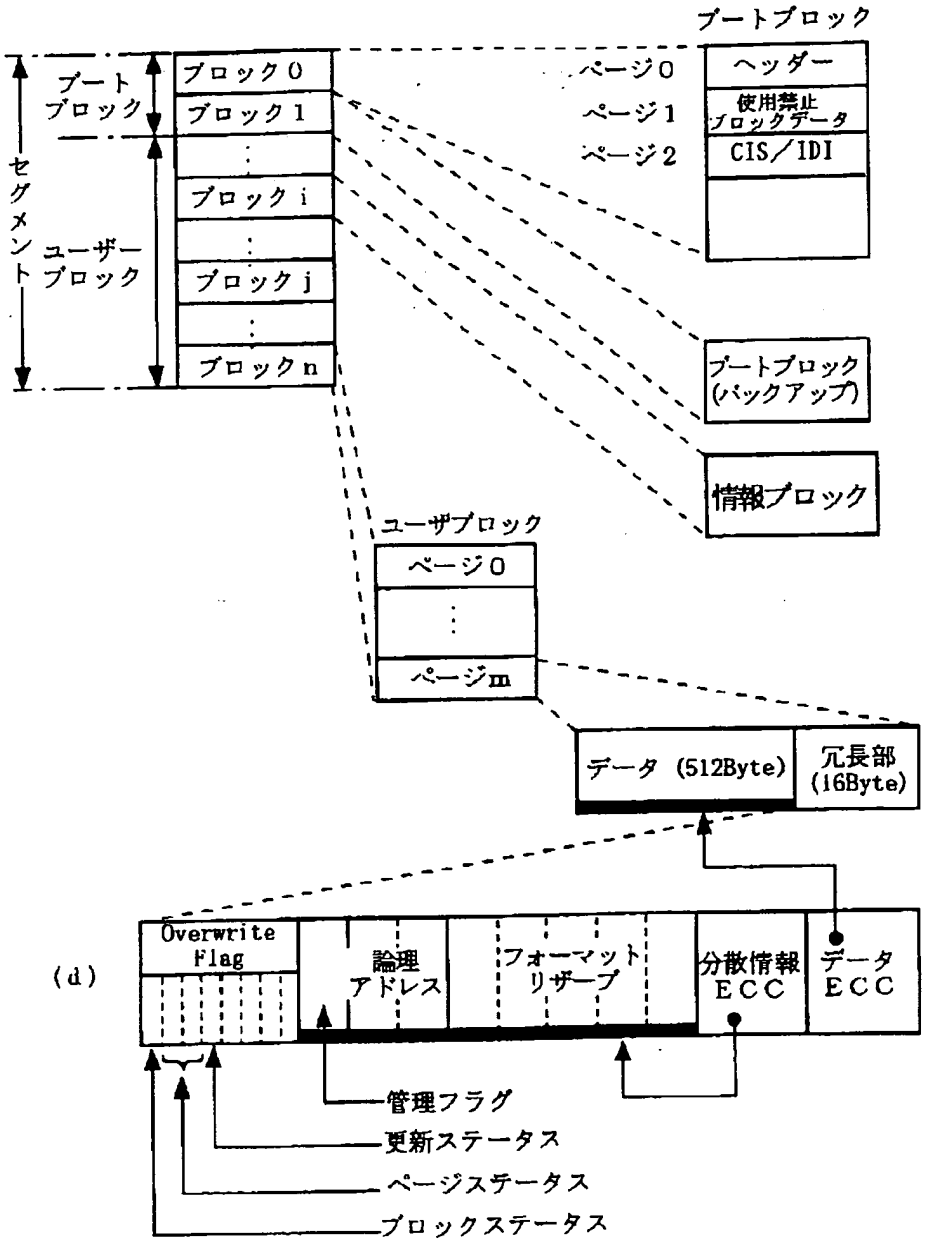


ファイルシステム処理階層

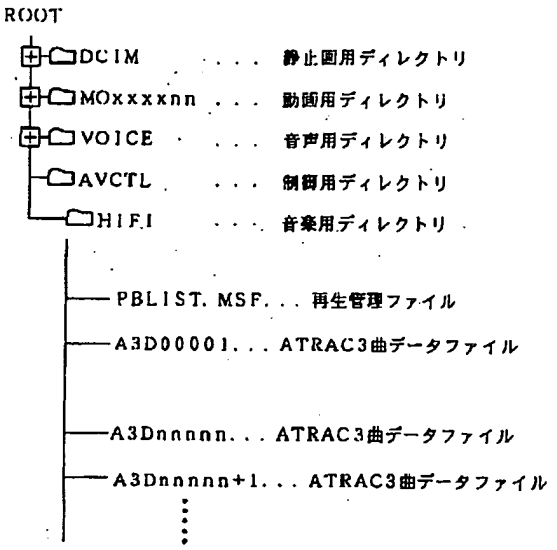
[Drawing 11]



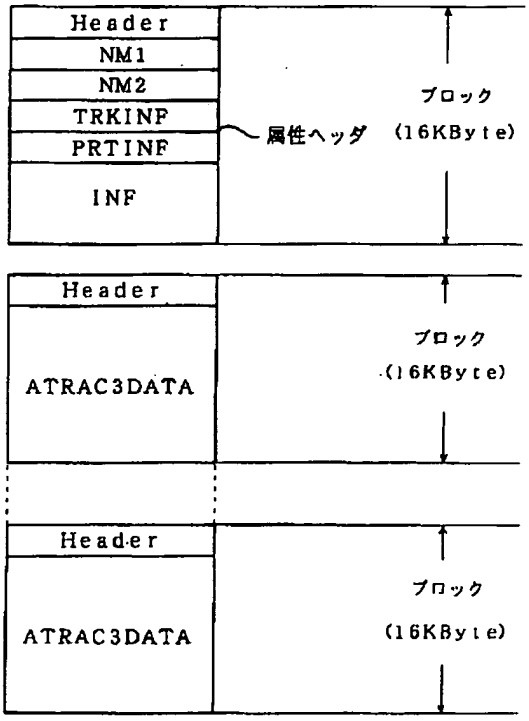
[Drawing 5]


ブートブロック
ブロック0
ブロック1
ブロックi
ブロックj
ブロックn
ブート
ブロック
ユーザー
ブロック
セグメント
ページ0
ページ1
ページ2
ヘッダー
使用禁止
ブロックデータ
CIS／IDI
ブートブロック
(バックアップ)
情報ブロック
ユーザブロック
ページ0
ページm
データ (512Byte)
冗長部
(16Byte)
(d)
Overwrite
Flag
論理
アドレス
フォーマット
リザーブ
分散情報
ECC
データ
ECC
管理フラグ
更新ステータス
ページステータス
ブロックステータス

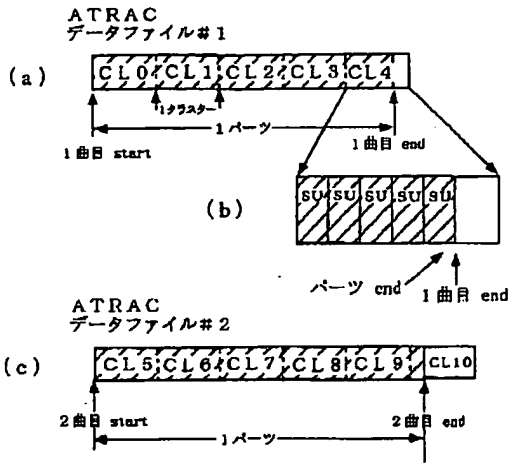
[Drawing 6]



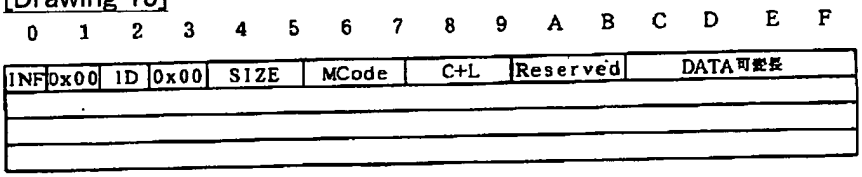
[Drawing 8]
1つのATRAC3曲データファイル



[Drawing 9]

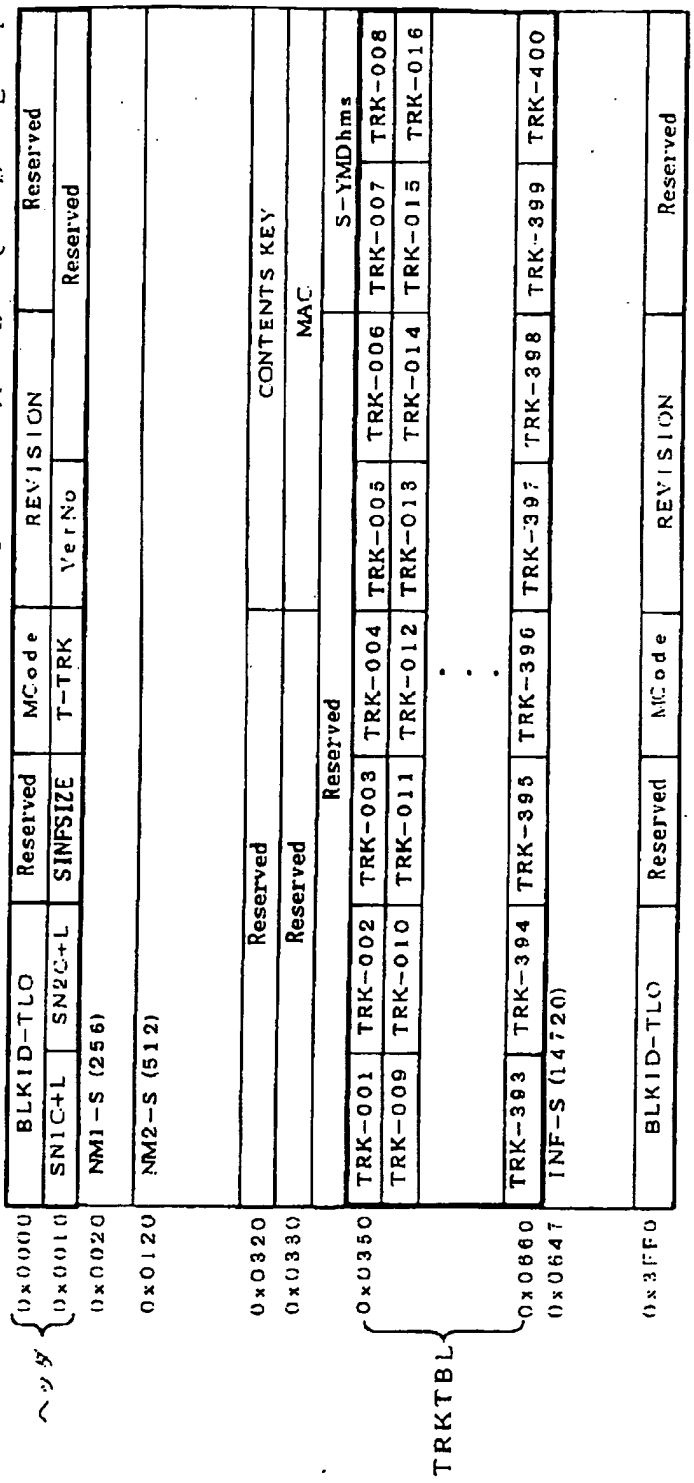


[Drawing 13]



付加情報データ（INF−S）

[Drawing 12]


再生管理ファイル（PBLIST）
0 1 2 3 4 5 6 7 8 9 A B C D E F
BLKID-TLO
Reserved
MCode
REVISION
Reserved
SN1C+L
SN2C+L
SINFSIZE
T-TRK
VerNo
Reserved
NM1-S (256)
NM2-S (512)
Reserved
CONTENTS KEY
Reserved
MAC
Reserved
S-YMDhms
TRK-001
TRK-002
TRK-003
TRK-004
TRK-005
TRK-006
TRK-007
TRK-008
TRK-009
TRK-010
TRK-011
TRK-012
TRK-013
TRK-014
TRK-015
TRK-016
TRK-393
TRK-394
TRK-395
TRK-396
TRK-397
TRK-398
TRK-399
TRK-400
INF-S (14720)
BLKID-TLO
Reserved
MCode
REVISION
Reserved
ヘッダ
TRKTBL
0x0000
0x0010
0x0020
0x0120
0x0320
0x0330
0x0350
0x0660
0x0647
0x3FF0

[Drawing 14]

付加情報キーコード

ID	音楽関係（文字）		ID	URL（Web関係）	
0	reserved		32	reserved	
1	アルバム	可変	33	アルバム	可変
2	サブタイトル	可変	34	サブタイトル	可変
3	アーティスト	可変	35	アーティスト	可変
4	指揮者	可変	36	指揮者	可変
5	オーケストラ	可変	37	オーケストラ	可変
6	プロデューサ	可変	38	プロデューサ	可変
7	発行・出版社	可変	39	発行・出版社	可変
8	作曲者	可変	40	作曲者	可変
9	作詞者	可変	41	作詞者	可変
10	編曲者	可変	42	編曲者	可変
11	スポンサー	可変	43	スポンサー	可変
12	CM	可変	44	CM	可変
13	解説	可変	45	解説	可変
14	原曲名	可変	46	原曲名	可変
15	原曲アルバム名	可変	47	原曲アルバム名	可変
16	原曲作曲者	可変	48	原曲作曲者	可変
17	原曲作詞者	可変	49	原曲作詞者	可変
18	原曲編曲者	可変	50	原曲編曲者	可変
19	原曲演奏者	可変	51	原曲演奏者	可変
20	メッセージ	可変	52		
21	コメント	可変	53		
22	警告	可変	54		
23	ジャンル	可変	55		
24	文章	可変	56		
25			57		
26			58		
27			59		
28			60		
29			61		
30			62		
31			63		

[Drawing 15]

付加情報キーコード

ID	パス／その他		ID	制御／数値データ関係	
64	Reserved		96	Reserved	
65	画像データへのパス	可変	97	ISRC	8
66	歌詞データへのパス	可変	98	TOC_ID	8
67	MIDIデータへのパス	可変	99	UPC／JAN	7
68	解説データへのパス	可変	100	収録日 (YMDhms)	4
69	コメントデータへのパス	可変	101	発売日 (YMDhms)	4
70	CMデータへのパス	可変	102	原曲発売日 (YMDhms)	4
71	FAXデータへのパス	可変	103	録音日時 (YMDhms)	4
72	通信データ1へのパス	可変	104	サブトラック	4
73	通信データ2へのパス	可変	105	平均音量	1
74	制御データへのパス	可変	106	レジューム	4
75			107	再生ログ (YMDhms)	4
76			108	再生回数（学習用）	1
77			109	PASSWORD1	16
78			110	APPLevel	16
79			111	ジャンルコード	2
80			112	MIDIデータ	可変
81	パーツ付加情報	可変	113	サムネール写真データ	可変
82			114	文字放送データ	可変
83			115	総曲数	2
84			116	セット番号	1
85			117	総セット番号	1
86			118	REC位置情報−GPS	可変
87			119	PB 位置情報−GPS	可変
88			120	REC位置情報−PHS	可変
89			121	PB 位置情報−PHS	可変
90	DISC−TOC	可変	122	接続先電話番号1	可変
91			123	接続先電話番号2	可変
92			124	入力値	可変
93			125	出力値	可変
94			126	PB制御データ	可変
95			127	REC制御データ	可変

[Drawing 19]

A

bit	意味	値
7	ATRAC3のモード	0：Dual　　1：Joint
6 5 4	レートの値	N　表示　Time　Rate　SU　Byte 7　HQ　47min　176kbps　31SU　512 6　EX　58min　146kbps　38SU　424 5　EX　64min　132kbps　42SU　384 4　SP　81min　105kbps　53SU　304 3　LP　90min　94kbps　59SU　272 2　LP　128min　66kbps　84SU　192 1　MN　181min　47kbps　119SU　136 0　MN　258min　33kbps　169SU　96 （Nはbit6，5，4の3ビットの値） ＊N＝0，1のモノラルは、bit7が「1」(Joint)で，メイン信号のみの特別なJointモードをモノラルとして規定する
3	Reserved	−
2	データ区分	0：オーディオ　　1：その他
1	再生SKIP	0：通常再生　　1：SKIP
0	エンファシス	0：OFF　　1：ON (50／15μs)

[Drawing 16]

付加情報キーコード

ID	同期再生関係	
128	reserved	
129	同期再生関係1	可変
130	同期再生関係2	可変
131	同期再生関係3	可変
132	同期再生関係4	可変
133	同期再生関係5	可変
134	同期再生関係6	可変
135		
136		
137		
138	EMD関連1	可変
139	EMD関連2	可変
140		
141		
142		
143		
144		
145		
146		
147		
148		
149		
150		
151		
152		
153		
154		
155		
156		
157		
158		
159		

[Drawing 20]

CC

bit	意味		値	
7	コピー制御	コピー可否	0：コピー禁止	1：コピー可
6		世代	0：オリジナル	1：第1世代以上
5 4	高速デジタルコピー制御(HCMS)		00：コピー禁止 10：コピー可	01：コピー第1世代
3 2 1	コピー属性		000：Reserved 001：オリジナルソースから記録したコンテンツ 010：LCMからコピーしたコンテンツ 011：LCMからムーブしたコンテンツ 100以上：Reserved	
0	Reserved		-	

LCM：Licensed Compliant Module

例：PCやコンシューマ機器のHDD等

[Drawing 17]

(a)

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
INF	0x00	ID	0x00	SIZE		Mcode		CTL		Reserved		可変長データ			

(b)

ID		アーティスト		サイズ		ASCII 英語						データ			
0x69	0x00	3	0x00	0x1C(28)		Mcode		0x01	0x09	0x00	0x00	S	I	M	O
N	&	A	B	C	D	E	F	G	H	]	0x00				

(c)

サイズ	2進級 設定無し					ID		ISRC	
0x14(20)	Mcode	0x00	0x00	0x00	0x00	0x69	0x00	97	0x00
						ISRC Code 8Byte			

データ

(d)

ID		録音日		サイズ		2進級 設定無し				データ
0x69	0x00	103	0x00	0x10(16)	Mcode	0x00	0x00	0x00	0x00	YMD hms

745 565

Y	M	D	h	m	s

31, 30, 29 3, 2, 1. 0bit

(e)

ID		再生ログ		サイズ		2進級 設定無し				データ
0x69	0x00	103	0x00	0x10(16)	Mcode	0x00	0x00	0x00	0x00	YMD hms

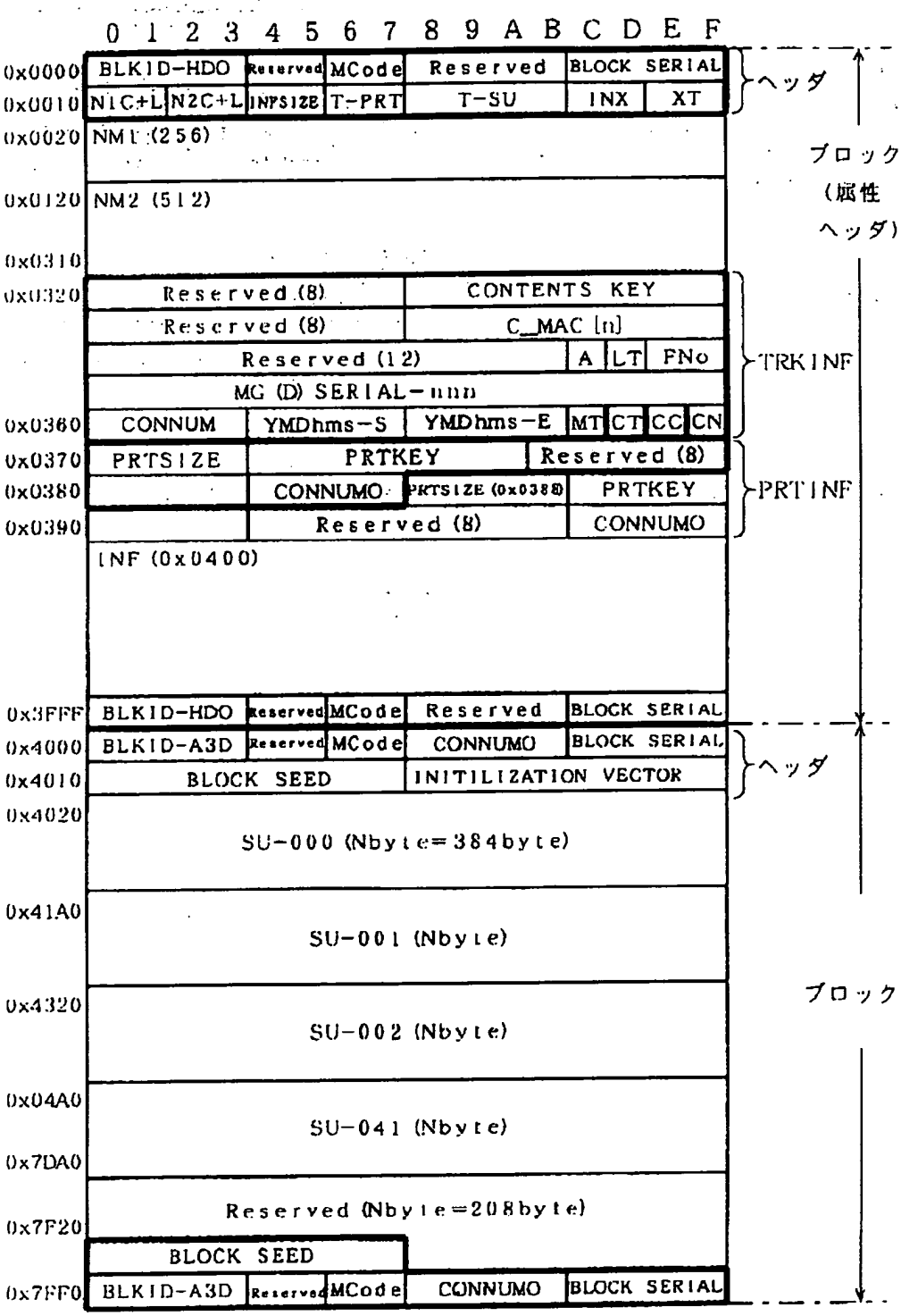
745 565

Y	M	D	h	m	s

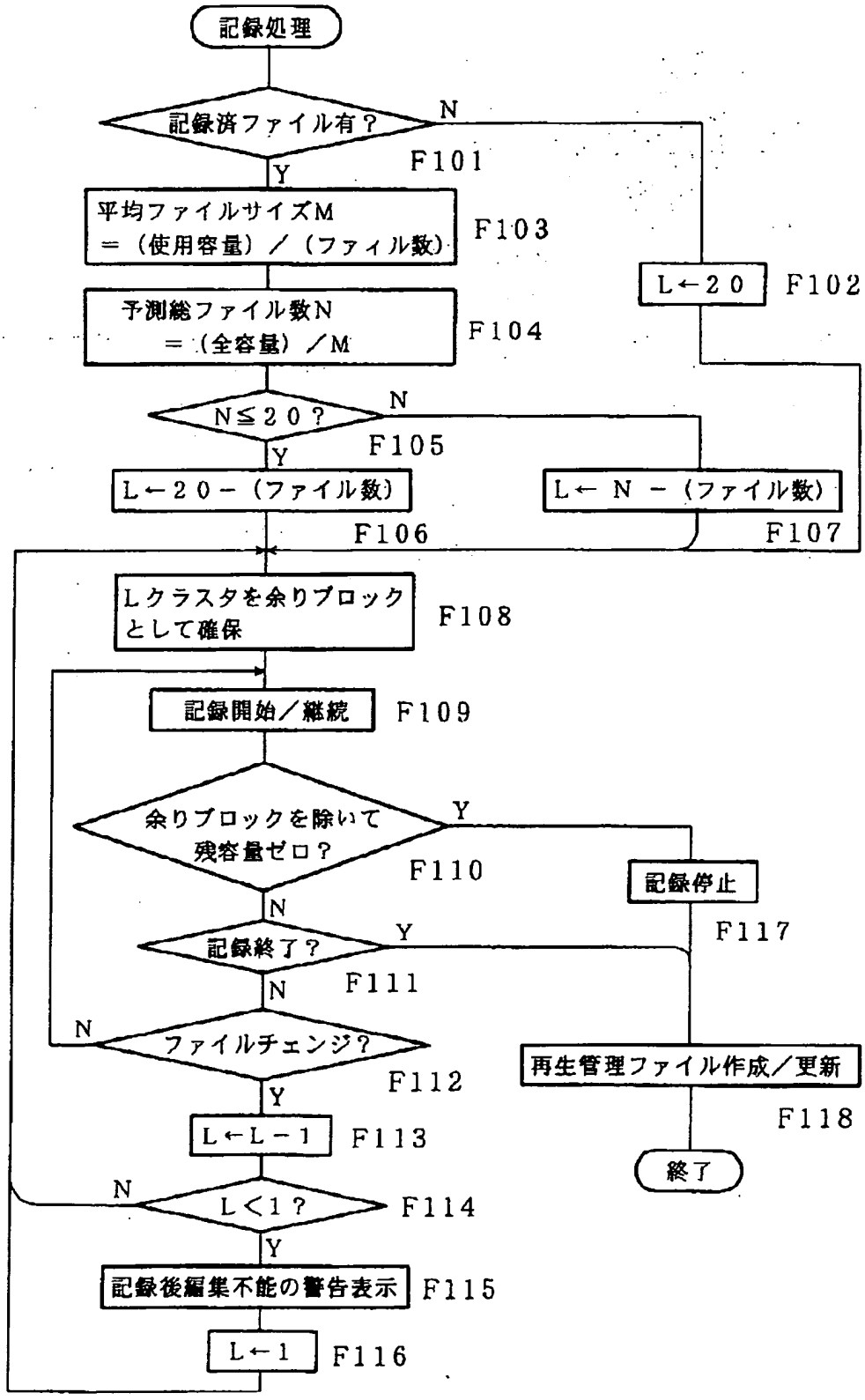
31, 30, 29 3, 2, 1. 0bit

[Drawing 18]

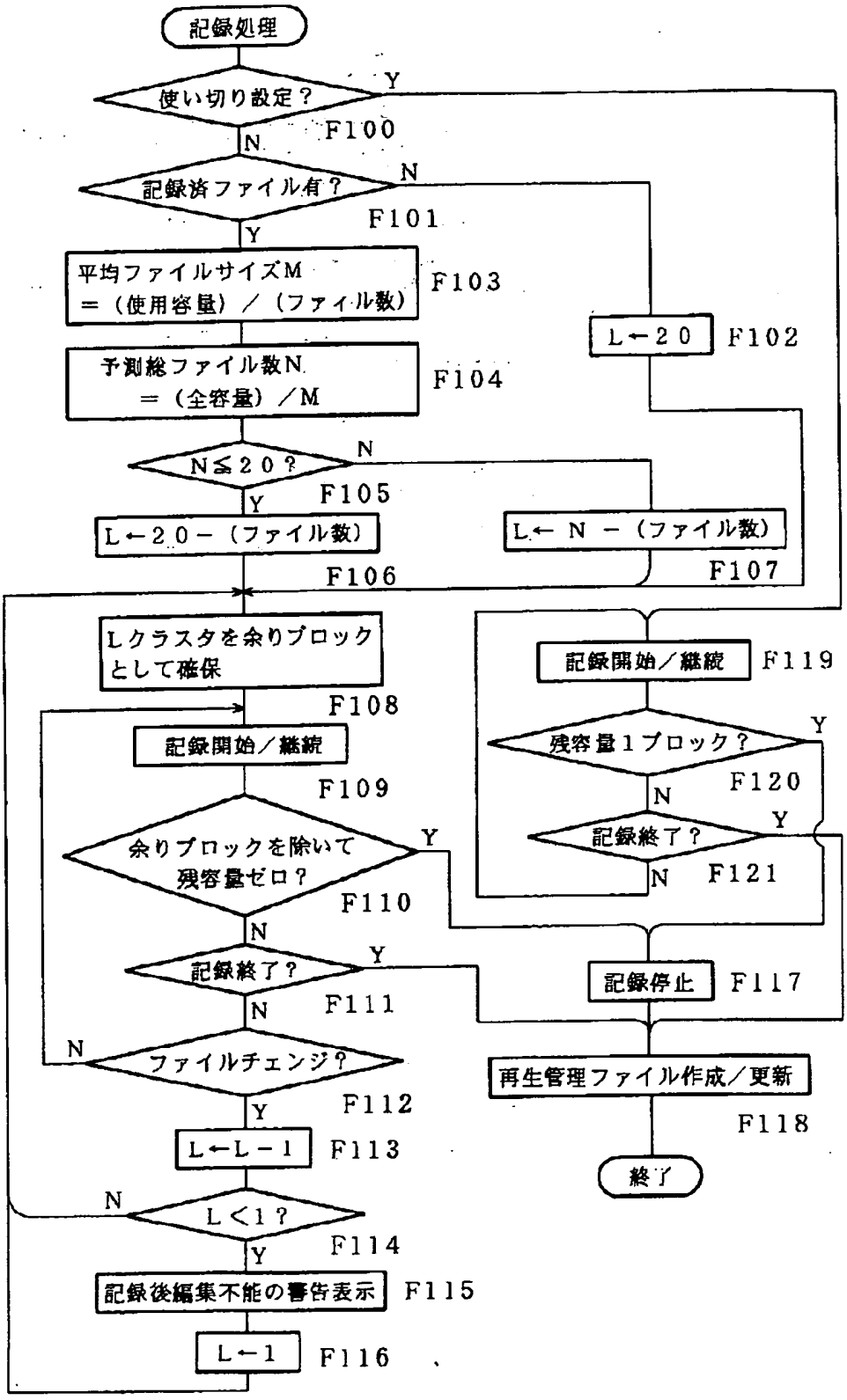
A3Dnnnnn. MSA (ATRAC3データファイル)



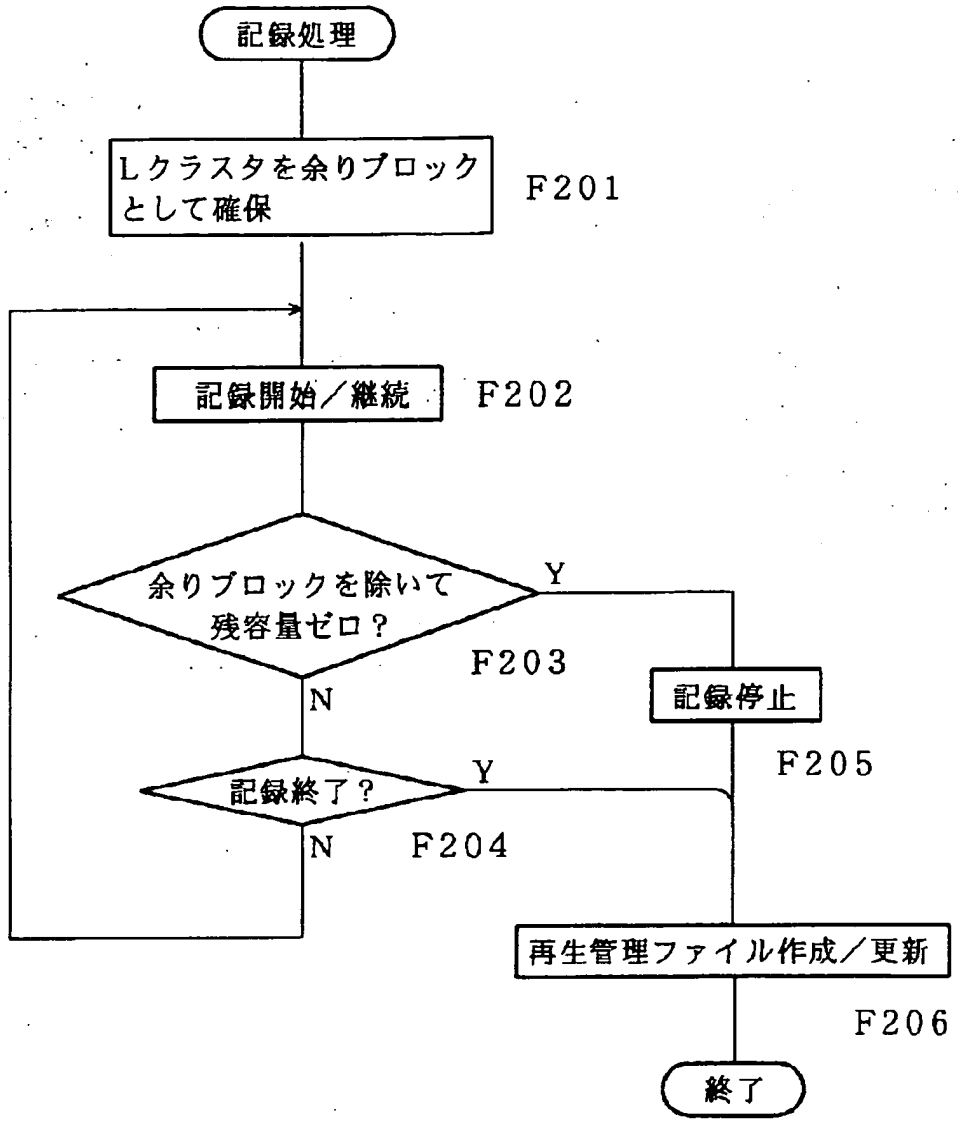
[Drawing 21]


記録処理
記録済ファイル有？
N
Y
F101
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
予測総ファイル数N
＝（全容量）／M
F104
L←２０
F102
N≦２０？
N
Y
F105
L←２０－（ファイル数）
L← N －（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
記録停止
F117
N
記録終了？
Y
F111
N
ファイルチェンジ？
N
F112
Y
再生管理ファイル作成／更新
F118
L←L－１
F113
終了
N
L＜１？
F114
Y
記録後編集不能の警告表示
F115
L←１
F116

[Drawing 22]


記録処理
使い切り設定？
Y
F100
N
記録済ファイル有？
N
F101
Y
平均ファイルサイズM
＝（使用容量）／（ファイル数）
F103
予測総ファイル数N
＝（全容量）／M
F104
L←20
F102
N≦20？
N
F105
Y
L←20－（ファイル数）
L←N－（ファイル数）
F106
F107
Lクラスタを余りブロック
として確保
F108
記録開始／継続
F109
余りブロックを除いて
残容量ゼロ？
Y
F110
N
記録終了？
Y
F111
N
ファイルチェンジ？
N
F112
Y
L←L－1
F113
L＜1？
N
F114
Y
記録後編集不能の警告表示
F115
L←1
F116
記録開始／継続
F119
残容量1ブロック？
Y
F120
N
記録終了？
Y
F121
N
記録停止
F117
再生管理ファイル作成／更新
F118
終了

[Drawing 23]



[Translation done.]